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A NOVEL KIND OF HEATING BODIES FOR CENTRAL HEATING PLANTS

BY DR. ALFRED GRADENWITZ

Central heating plants are being more and more widely adopted, both in England and on the European continent, on account of their special advantages. The uniformity, convenience and cleanliness in the operation of such a plant, doing away with the handling of coal and ashes, are indeed to be highly valued. As the number of fireplaces in a building is reduced to one, the danger of a fire is diminished considerably.

A drawback so far experienced in connection with steam heating plants is the insupportable heat given off from the heating bodies, rendering any stay in their neighborhood quite impossible, while the danger of being burnt is by no means excluded. This intense heat radiation is due to the surface of the heating bodies being surrounded on all sides by the heating medium.

This inconvenience is obviated to a degree in a novel kind of radiator designed by Mr. F. Otto Richter, of Dessau, Germany. Any intense heat radiation from these heating bodies is prevnted by arranging air channels on the outside of the heating bodies (See Figs. 1, 2 and 3) so as to produce a permanent air circulation. The external shape of the heating body has not been altered in any way, while the internal arrangement shows the distinctive feature of a central stem *a* which has been fitted into each vertical tube *d* of the radiator, the channel *b* thus formed towards the room to be heated being left open both at its upper and lower ends.

The difference in temperature in these channels results automatically, and without the adjustment of any valves, in a permanent circulation of the air in the room. The surface of the heating body is so cooled down by the permanent removal of the colder air from the floor of the room, that no inconvenient heat is given off from the radiators even in the case of their being put to the highest strain.

In Fig. 1 the front side of a similar heating body and, in Fig. 2, a horizontal cut through the same are represented, while Fig. 3 shows a cut through a somewhat modified type. The arrows in the first figure show the way the air enters the bottom of the channel and issues from the top in a heated state. As seen from Fig. 2, the air channels *b* are situated in the outer part of the radiators, while it is possible to arrange them in the two terminal members of the heating body so that no steam heating surface is bare (Fig. 3).

This novel heating body, besides offering the above advantages, shows, as compared with ordinary smooth radiators, the further good point that the amount of heat given off with the same size and under identical conditions is 25 per cent. higher. As regards the question

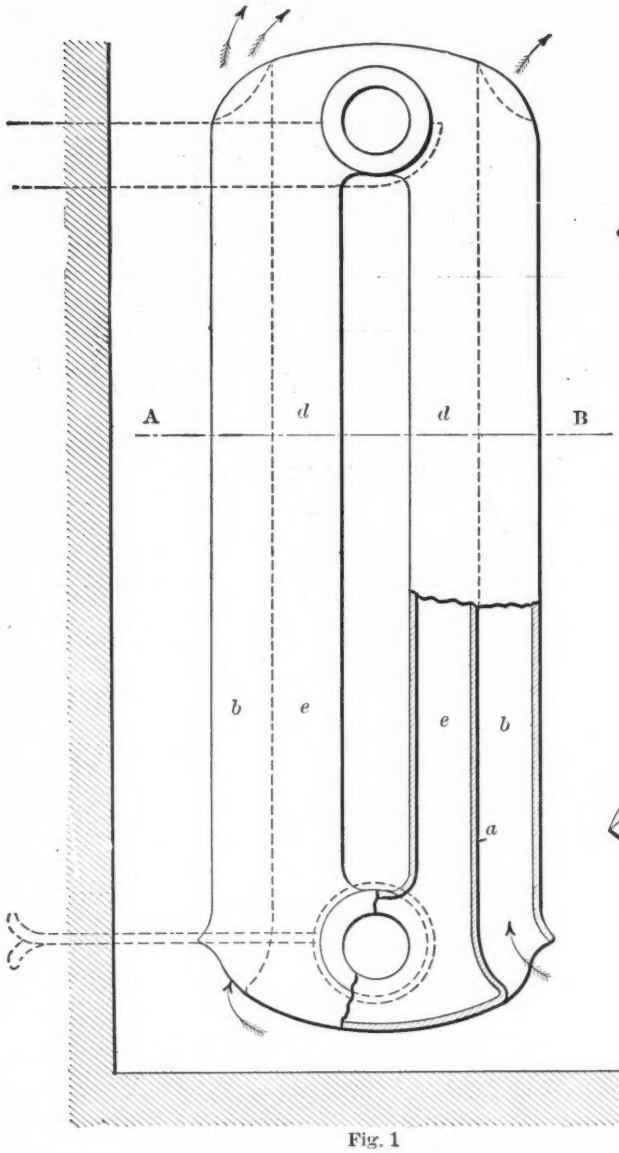


Fig. 1

NOVEL TYPE OF RADIATOR, SHOWING AIR CHAMBER

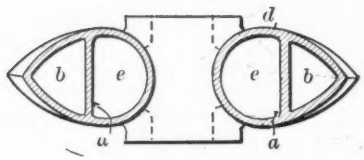


Fig. 2

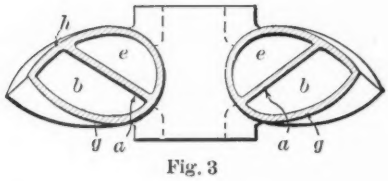
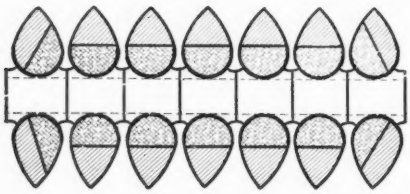


Fig. 3

whether these radiators have the advantage, also, of the familiar ribbed radiators, this has not so far been decided, though it seems likely to be the case on account of the speed of air in the channels being probably greater than between ribs.



CROSS SECTION OF RADIATOR

The weight of a member 1.25 m. in height and consisting of two legs, is about 23.5 kgs. (51.808 lbs.), as against 20 kgs. (44.092) with smooth radiators and about 30 kgs. (66.138 lbs.) with ribbed radiators. The increase in weight as compared with smooth radiators of the same size will, however, be reduced considerably in a new type to be brought out shortly.

As the dimensions of the new radiator, on account of its higher efficiency, may be reduced considerably, the cost of installation is diminished

to a great extent, while the quality of heating is improved. In fact, on account of the air circulation above referred to, the whole of the air in the room, even on the floor, is heated uniformly, while the heating of a cold room is accomplished more rapidly.

CORRECTING POOR HEATING JOBS

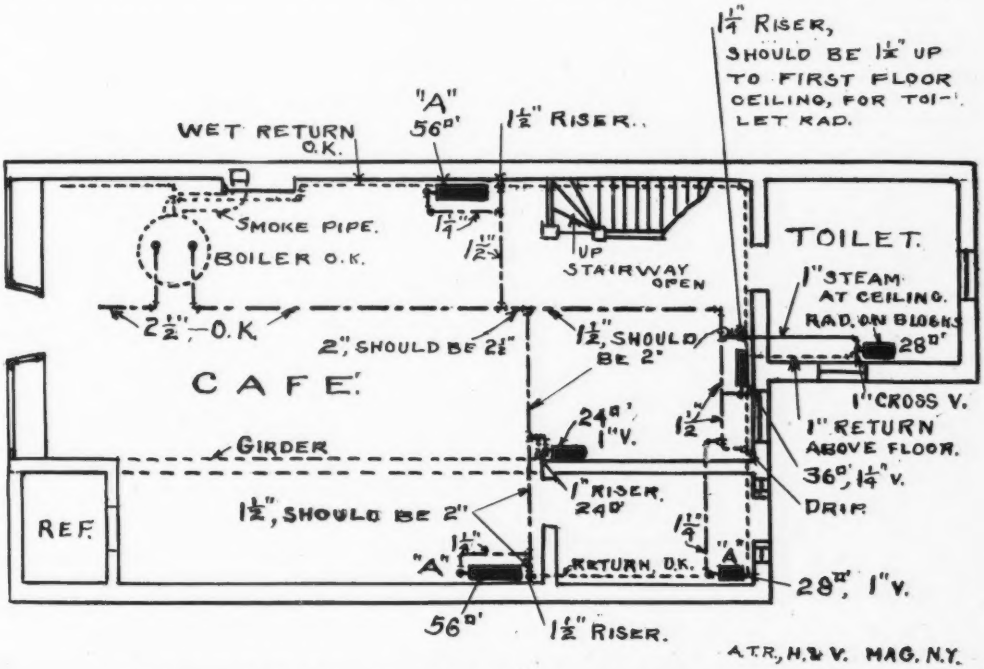
By Arthur T. Richmond

Some time ago I examined a steam heating apparatus in a building undergoing some alterations, and in which a few of the radiators were to be set in new positions. Also, one or two radiators were sluggish, having never been fully heated.

The building was a four-story and basement dwelling, the alterations being in the basement, and the radiators marked "a" in the sketch being shown in new positions. The radiator most sluggish was in the toilet room at the rear, seven sections, 28 square inch. The supply for this was through a 1-inch pipe taken near the ceiling from the 1¼-inch riser in the room next to the front, dropping near the radiator, the connection to the radiator being through a 1-inch cross valve. The condensation passed through the lower outlet of the cross valve to the return main, 1-inch to the water line. Thus there was a continuous circulation through that line past the valve whether the valve was open or not.

My proposal, however, was to increase the sizes of the piping as shown, the return being below the water line and large enough. The boiler evidently was of ample size. A comparatively small boiler may often be made to do the work required by having pipes of sufficient size to allow the necessary amount of steam to flow through easily with positive pitches to avoid water pockets, and without unnecessary obstructions. Steam will go where you want it to, if you have the power to drive it, and give it a free conduit.

Doubtless the rear radiator in the toilet room would be somewhat



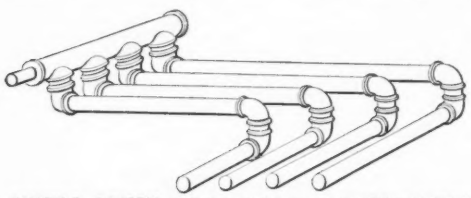
CORRECTING A POOR HEATING JOB.

more positive in its operation if the steam were admitted at the farther end, the radiator being turned round to have the return end nearest the main, making it a two-pipe radiator. I consider, however, that increasing the size of the piping, as shown, will give satisfactory results and this increase is needed for the rest of the system.

I have often had even eight section radiators heating quickly and fully through a 1-inch single valve. I know a house where a coil of 30 to 35 square inches of 2-inch pipe is easily heated through a single $\frac{3}{4}$-inch valve. The coil has a good pitch upward to the further end, and is equipped with a 1-inch supply with relief directly underneath the valve which is on the first floor.

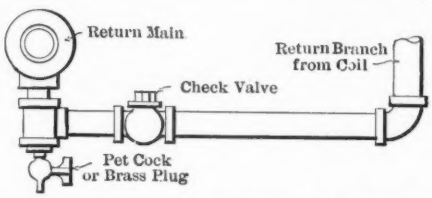
I was told the other day about a greenhouse, 200 feet long, with one 2-inch pipe at the ridge, running from the boiler to the further end, and there dividing to supply four $1\frac{1}{4}$-inch pipes on each side, running back under the benches. This made a total of over 825 square feet of surface including the 2-inch line at the ridge.

My informant was told by the owner that last winter they often sat up all night firing to the full capacity of the boiler with wood and best coal, with sufficient pressure to completely fill a correctly piped system, yet they could not heat all the coils, and plants were frozen night after night. There are many irregularities in pitch in the bench coils, forming pockets where water gathers, requiring extra pressure to force it along.



SWING JOINT FOR USE IN GREENHOUSE HEATING

This will be remedied by running an additional line of 2-inch pipe at the ridge, each 2-inch line supplying one side of the house, also by straightening the grade under the benches with as good pitch as possible. The boiler is evidently of sufficient size. The angle pieces at each end should also be as long as possible, that the almost unavoidable inequality of expansion of the several pipes in the coil may be kept as far away from the header as possible. If it is impossible to use angle pieces at each end there should be a swing joint at one end in a house of this length, composed of elbows and nipples, as shown below.



WATER SEAL TO PREVENT AIR BINDING

The automatic air valve should be placed one or two feet above the return handle to prevent overflowing in case of rapid accumulation of water at first heating up, from cold pipes, and should also have a positive attachment for quickly relieving the coil of air at such times.

When there are a number of greenhouses of varying or similar lengths heated from a central boiler house, or several coils in a single house the steam may very likely circulate more quickly through some of the coils than through others and get into the return main and pass by the return branches of some coils which have not yet become completely filled with steam. If there are no means of prevention, this steam will enter these coils through the "back door," closing the automatic air valve, preventing the complete expulsion of the air in the coil so that the coil will not be entirely heated. To prevent this, there should be a check valve on the return branch below the water line. The use of a check valve will obviate the necessity of a hand valve and at the same time be automatic. If this return branch is

in the boiler room, or where it can drop immediately to the main return below the water line, no false water line will be necessary; but greenhouses are often built in ranges with extensive steam and return mains from a central boiler house. In such cases it is often inconvenient, expensive, and unnecessary to excavate trenches the entire distance to a sufficient depth to permit the return main to be carried below the water line, all the way. But we can carry it above the water line in a shallow trench and well protected from condensation, and put in an individual water seal at each branch by turning the outlet of the tee on the main downward, as in the sketch.

Another unsuccessful greenhouse heating plant recently coming to my notice is 100 feet long, with boiler of sufficient size, with heating surface consisting of three 1¼-inch pipes in continuous circuit round the house, the steam supply having a 2-inch diameter from the boiler to a point near the starting point of the coil near the boiler. Before reaching the coil, however, the supply is reduced to 1¼ inches, all the steam for the 280 square feet of coil surface having to pass through this 1¼-inch pipe. The pitch is upward to the farther end of the house, and downward on the return with more or less irregularities in grade.

This system will be changed as follows: Continue the 2-inch supply full size to a branch tee with a 2-inch run and three 1¼-inch outlets, the present distributer being through tees, nipples and elbows. Remove all irregularities in pitch and raise the starting end of the coil sufficiently to give a continuous fall in the direction of the flow of steam.

A better plan of revision would be to run the 2-inch supply to the farther end and divide, making one coil the length of the house on each side, following the natural grade. This would also allow for a door in the end of the house, which would be difficult with one coil making the complete circuit.

Where a greenhouse is not on level ground, the boiler is usually at the lower end, unless the grade is so slight that the piping can be given the necessary pitch without difficulty. Having the boiler at the lower end, the steam main can usually be run near the ridge out of the way and still be given a downward pitch to the farther end, there taking a supply to a coil under each bench, thus allowing the condensation to run down with the steam.

Steam will be distributed more quickly to all parts of the house through the mains and several branches and coils than it will travel to the end of a single long coil making the entire circuit of the long house. The quantity of heat can also be better controlled to suit the weather when one or more out of several coils can be turned on or off. In a house of 150 feet, or 200 feet length I would prefer to divide each side into two coils, each of half the length of the house, though not increasing the total radiating surface. The extra first cost of valves and connections required for the greater number of smaller coils may easily be more than offset by the greater convenience of control and better grade of plants thereby obtainable.

CROSS-SECTIONS OF CHIMNEYS

By C. C. Mulford

From the many widely varying rules for finding the cross section of a chimney per height of same when horse power is given it is difficult to fix upon any one, as "one man's food seems to be another's poison." Therefore, I give the following rule and table, based upon

TABLE 1.—CROSS-SECTIONS OF CHIMNEYS

	38	44	50	56	60	65	70	75	80	85	90	95	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
1	64	64	64																														
2	64	64	64	64																													
3	64	64	64	64	64																												
4	64	64	64	64	64	64																											
5	72	66	64	64	64	64	64																										
6	84	79	74	70	68	65	63	60																									
7	101	92	87	82	79	76	73	71	68																								
8	115	107	99	94	90	87	84	82	79	77																							
9	130	118	111	105	101	97	94	90	87	86	83	81																					
10	144	131	123	117	112	108	104	100	97	96	92	89	87	83	79	76																	
12	173	157	148	140	134	130	125	121	117	115	110	107	104	99	94	91	88	86															
14	220	186	173	163	157	151	146	142	136	134	129	125	121	116	110	106	102	101	95														
16	230	210	197	187	180	173	167	161	155	154	147	143	138	131	124	121	118	113	109														
18	247	236	226	210	202	195	187	181	175	173	166	160	151	148	141	137	132	131	119														
20	288	266	248	247	224	216	208	202	194	192	184	178	173	165	157	152	142	144	136														
25	356	332	308	292	282	270	260	251	244	240	230	222	216	206	197	189	183	180	170														
30	435	392	370	350	338	324	312	301	291	288	276	267	260	247	236	227	220	216	220														
35	550	459	432	410	393	378	364	352	340	336	322	312	302	288	275	265	256	252	238														
40			495	467	450	432	417	402	388	385	368	356	346	329	314	303	293	288	272	266	258												
45			557	525	505	486	469	452	436	433	414	400	389	370	354	342	333	324	306	299	290												
50			617	584	562	540	520	503	485	480	460	445	432	412	393	379	366	360	340	332	322												
55			680	642	617	594	572	552	534	527	505	490	475	452	432	417	402	396	374	366	354												
60			740	700	672	648	624	603	582	575	550	535	520	494	472	455	440	432	407	398	387												
65			802	760	730	702	675	652	631	625	598	580	562	535	510	492	476	467	442	432	419												
70			862	817	785	755	730	705	680	672	642	625	605	575	550	531	512	504	477	465	452												
75			925	875	840	810	782	752	727	720	690	668	648	617	590	568	550	540	510	499	484												
80			987	934	897	865	831	803	777	767	736	710	692	658	627	606	590	576	544	532	516												
85			1026	999	955	917	885	855	825	816	781	757	735	700	667	645	628	612	578	565	548												
90			1123	1051	1016	972	936	904	875	864	825	800	777	740	707	682	660	648	612	597	580												
95			1170	1108	1007	1003	999	955	922	912	875	846	827	782	746	720	696	684	647	636	612												
100			1235	1166	1123	1080	1040	1005	970	960	922	890	865	822	786	757	732	720	680	665	645												
105			1296	1225	1178	1118	1090	1055	1020	1009	965	936	907	865	825	796	768	756	715	697	677	657	648										
110			1353	1254	1238	1119	1115	1105	1007	1055	1010	980	950	905	865	834	805	792	749	732	710	689	679										
115			1411	1340	1290	1240	1200	1150	1102	1100	1006	1002	995	945	902	870	840	828	782	764	741	720	710										
120			1483	1400	1345	1295	1250	1205	1155	1150	1102	1070	1038	987	942	910	880	865	816	797	774	752	740										
125			1541	1451	1400	1350	1300	1250	1210	1200	1150	1115	1080	1041	982	947	915	900	850	830	806	782	771										
130			1650	1518	1451	1410	1352	1305	1251	1263	1195	1159	1122	1065	1021	985	950	937	885	865	837	815	802										
135			1665	1570	1512	1451	1405	1355	1310	1298	1240	1201	1166	1109	1061	1022	998	972	920	897	870	845	824										
140			1728	1635	1570	1510	1458	1405	1339	1342	1287	1248	1210	1150	1094	1051	1022	1008	952	930	902	877	864										
145			1790	1691	1630	1562	1510	1452	1408	1390	1330	1290	1252	1195	1137	1094	1051	1037	987	962	935	907	895										
150			1850	1750	1656	1620	1560	1509	1452	1440	1380	1335	1295	1234	1152	1173	1094	1076	1019	997	967	940	925										
155			1915	1810	1740	1672	1615	1568	1502	1488	1425	1380	1340	1267	1210	1166	1135	1108	1054	1022	1000	970	957										

TABLE 2—CROSS-SECTIONS OF CHIMNEYS

	38	44	50	56	60	65	70	75	80	85	90	95	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
160			1975	1870	1795	1730	1665	1608	1552	1535	1470	1425	1382	1329	1253	1210	1166	1152	1080	1065	1036	1000	988										
165			2020	1925	1850	1780	1720	1658	1600	1585	1518	1470	1425	1353	1296	1252	1209	1189	1135	1095	1066	1045	1020										
170			2100	1985	1910	1835	1770	1710	1750	1630	1565	1518	1444	1400	1335	1290	1245	1225	1158	1130	1097	1065	1005	1012	992	980	948						
175			2160	2042	1962	1890	1820	1755	1700	1680	1610	1560	1515	1444	1372	1328	1280	1260	1190	1162	1130	1098	1080	1042	1022	1009	975						
180			2221	2100	2010	1945	1875	1810	1750	1730	1652	1602	1555	1483	1415	1365	1320	1298	1225	1198	1160	1128	1111	1072	1050	1038	1002						
185			2280	2160	2080	2000	1930	1860	1795	1775	1700	1635	1600	1522	1451	1400	1355	1332	1259	1230	1202	1160	1042	1102	1080	1064	1031						
190			2342	2220	2124	2065	1980	1910	1840	1820	1760	1695	1642	1565	1492	1440	1392	1390	1292	1262	1225	1190	1172	1132	1110	1095	1060						
195			2405	2280	2245	2102	2015	1960	1895	1870	1795	1740	1685	1603	1530	1478	1428	1405	1328	1295	1258	1220	1205	1162	1138	1122	1088						
200			2470	2330	2240	2160	2080	2005	1940	1920	1838	1780	1730	1648	1570	1515	1462	1440	1360	1380	1290	1252	1235	1192	1168	1151	1115						
210			2590	2441	2348	2270	2190	2158	2018	2005	1930	1870	1815	1730	1650	1591	1538	1511	1430	1395	1352	1315	1295	1250	1235	1210	1170						
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230			2828	2680	2568	2482	2385	2305	2215	2202	2108	2042	1989	1891	1805	1742	1685	1658	1565	1529	1482	1440	1420	1370	1342	1325	1281						
240			2960	2800	2649	2585	2500	2405	2315	2302	2202	2120	2068	1975	1885	1820	1758	1729	1632	1595	1548	1502	1480	1430	1400	1382	1338						
250			3080	2910	2801	2700	2602	2504	2412	2400	2300	2215	2160	2060	1964	1895	1830	1800	1700	1661	1611	1565	1542	1490	1460	1440	1392	1368	1350	1315			
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270			3340	3150	3030	2918	2810	2708	2610	2590	2480	2410	2318	2220	2120	2024	1975	1945	1838	1795	1740	1691	1668	1610	1575	1555	1505	1475	1460	1420			
280			3460	3270	3120	3021	2908	2808	2710	2682	2565	2488	2420	2302	2200	2120	2045	2018	1905	1860	1805	1755	1730	1670	1635	1612	1561	1530	1510	1475			
290			3580	3380	3250	3130	3020	2910	2810	2790	2660	2680	2510	2390	2280	2200	2120	2090	1975	1930	1870	1825	1790	1730	1692	1670	1615	1585	1515	1530			
300						3220	3110	3009	2905	2880	2760	2668	2548	2465	2360	2268	2200	2160	2040	1995	1935	1880	1850	1788	1750	1730	1672	1640	1620	1580			
310						3320	3210	3108	3000	2969	2821	2760	2680	2550	2428	2350	2270	2238	2110	2006	2000	1940	1915	1848	1810	1785	1730	1695	1672	1630			
320						3448	3321	3230	3110	3070	2940	2850	2760	2628	2518	2422	2341	2300	2168	2121	2060	2000	1975	1910	1815	1840	1780	1750	1725	1685			
330						3562	3450	3320	3210	3170	3030	2920	2845	2712	2590	2500	2408	2380	2221	2190	2130	2064	2020	1965	1930	1900	1840	1805	1780	1750			
340						3685	3540	3420	3300	3260	3130	3022	2940	2800	2681	2590	2490	2450	2318	2260	2190	2130	2100	2003	1985	1960	1895	1860	1835	1790			
350						3780	3640	3510	3400	3360	3250	3120	3020	2880	2745	2650	2560	2520	2380	2320	2260	2190	2160	2090	2041	2030	1950	1912	1890	1845			
360						3890	3750	3620	3500	3460	3310	3208	3110	2960	2830	2730	2640	2590	2450	2390	2320	2248	2220	2140	2100	2080	2008	1970	1945	1900			
370						4000	3850	3720	3590	3525	3400	3300	3200	3020	2910	2800	2710	2660	2520	2460	2380	2820	2280	2200	2160	2130	2060	2020	2000	1950			
380						4100	3960	3820	3686	3655	3500	3390	3280	3150	2980	2880	2780	2740	2580	2520	2445	2380	2340	2260	2220	2190	2120	2080	2050	2000			
390						4200	4052	3920	3780	3740	3581	3480	3380	3210	3060	2960	2860	2810	2650	2598	2520	2440	2410	2320	2280	2242	2180	2130	2110	2060			
400							4160	4020	3880	3840	3680	3560	3460	3300	3120	3030	2930	2880	2720	2660	2580	2500	2461	2370	2340	2300	2230	2190	2160	2110	2070		
410							4278	4120	3980	3940	3770	3630	3540	3380	3220	3110	3000	2960	2790	2720	2640	2565	2530	2446	2400	2360	2280	2240	2240	2160	2120		
420							4375	4220	4075	4040	3860	3740	3630	3460	3300	3180	3080	3022	2860	2800	2710	2630	2590	2500	2450	2420	2330	2300	2270	2218	2170		
430							4475	4320	4178	4120	3950	3830	3720	3540	3380	3260	3150	3100	2920	2880	2770	2690	2660	2560	2510	2480	2400	2350	2320	2265	2220		
440							4580	4425	4275	4224	4050	3920	3800	3620	3460	3340	3220	3170	3006	2920	2840	2760	2720	2620	2570	2540	2450	2410	2380	2320	2280		
450							4675	4525	4375	4320	4148	4000	3890	3700	3520	3410	3300	3240	3060	2990	2900	2820	2780	2680	2630	2590	2510	2460	2430	2370	2330	2290	2248
460							4785	4625	4470	4425	4225	4100	3980	3780	3620	3490	3370	3318	3130	3060	2961	2880	2840	2740	2680	2650	2560	2518	2480	2420	2380	2340	2300
470							4900	4725	4550	4520	4325	4190	4070	3870	3700	3560	3440	3380	3200	3120	3030	2940	2900	2800	2740	2710	2620	2570	2540	2480	2430	2390	2340
480							5000	4825	4650	4600	4420	4275	4150	3950	3770	3640	3520	3460	3260	3190	3100	3000	2960	2860	2800	2780	2680	2620	2589	2525	2480	2440	2400
490							5100	4925	4750	4700	4510	4350	4248	4048	3850	3720	3590	3530	3340	3260	3160	3070	3020	2920	2860	2820	2730	2680	2650	2580	2540	2490	2450
500							5200	5025	4850	4800	4600	4450	4325	4120	3930	3790	3660	3600	3400	3320	3220	3130	3090	2980	2920	2880	2790	2740	2700	2640	2590	2540	2500
510																																	
520																																	

my practical experience as the one I have found to fill all wants. Assuming that every reader knows that the difference between the degrees of the gases in the chimney and that of the outside or surrounding air is the cause by which draft is effected, it will not be necessary to use up space and time by going into it to any great extent.

As air expands .002 of its volume for every degree it is raised above 32° F., the chimney must be made to conform to the demands for space. This can be done in two ways: first, by increasing the cross-section area; second, by increasing the height, which gives greater velocity and thus takes care of the increased volume, the latter being the more practical one.

The economical flue for a dwelling house should have a velocity not to exceed from five to seven feet per second. This may be had in flues or chimneys, say, from 38 to 40 feet high by an increase of temperature from 10° to 12° above the outside air.

Tredgold's rule for chimneys for steam boilers is as follows: "The area of a chimney in inches for a low pressure steam engine, when above 10 H. P., should be 112 times the horse power of the engine, divided by the square root of the height of the chimney in feet.

"*Example:* Required area of a chimney for an engine of 40 H. P. its height being 70 feet. In this case

$$\frac{40 \times 112}{\sqrt{70}} = 533.2$$

square inches."

In another place Mr. Tredgold advises that chimneys be built double the size called for by this rule. In that event the chimney would contain 1066.4 square inches or about $7\frac{1}{2}$ square feet.

Milne's rule is the same as Tredgold's, only in place of 112 he uses 280. *Example:*

$$\frac{40 \times 280}{\sqrt{70}} = 1350$$

square inches, or 9 54/144 square feet.

Murray's rule—18 square inches for 12 lbs. of coal.

From Bax on Heat—H. P. 42.3, size of chimney at top, 2 feet; height, 80 feet.

From Babcock & Wilcox—H. P. 41, height of chimney, 70 feet; actual square feet, 2.41.

The writer—40 H. P.; height of chimney, 70 feet; 417 square inches, or 2.9 square feet.

Rule of thumb is that the size of the flue should be equal to the area of all the tubes.

Another rule for chimneys for horizontal flue boilers is that the chimney should be from 60 to 80 feet high, and have an area equal to half the square of the diameter of one of the tubes multiplied by the number of tubes.

I have stated only a few, but, I think, enough to show what a variety there is for one to choose from.

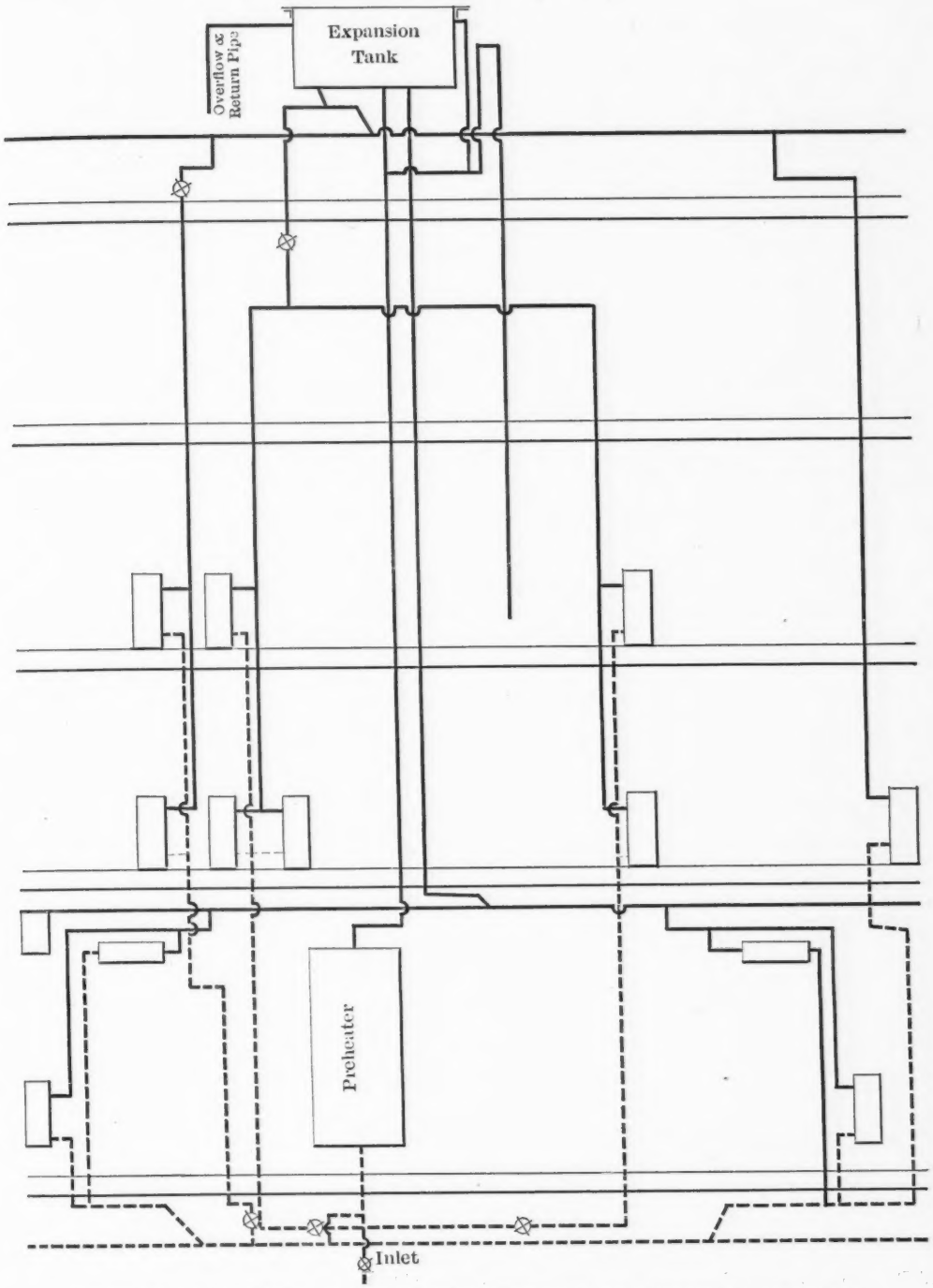
The accompanying table is compiled from the following rule: The area of a chimney in feet when above 10 H. P. should be .6 times the horse power divided by the square root of the height of the chimney in feet. *Example:*

$$\frac{40 \times .6}{\sqrt{70}} = 2.9$$

square feet. This should be reduced to square inches, as the table is in square inches.

PLANT IN COPENHAGEN MUNICIPAL HOSPITAL

In the following we propose describing a hot water heating plant which has recently been installed according to the "aero-circuit" system in the Copenhagen Municipal Hospital. This system was described at length in the November, 1904, issue.



SECTION OF HEATING PLANT IN THE COPENHAGEN MUNICIPAL HOSPITAL SHOWING INSTALLATION OF AERO-CIRCUIT SYSTEM

Two heating chambers for steam are provided, serving to preheat the air. Separate heating chambers for water in the cellar and some radiators in the other floors, serve to complete the heating of the air, and they are so arranged that there is 70 per cent. heating surface in the cellar and 30 per cent. heating surface in the other floors. The water heater is located at the level of the cellar ovens, and as the natural pres-

sure height of these is thus nil, an electric pump has to be employed for procuring a circulation of the water system at a speed corresponding to the pressure difference of one meter water column. The system is double pipe.

Messrs. Bruun & Sörensen secured contracts for this plant, and as one of the two self-contained systems has now been completed and subjected to severe tests, it will not be amiss to give a record of the same, as published in *Ingeniören*, Copenhagen.

The water pipe system was calculated according to Rietschel's formula. With the tests made, all the amount of steam susceptible of being condensed was conveyed to the preheater and the condensation of water both from this and from the steam air injector was weighed accurately after the equilibrum in steam temperature had been produced. With the expansion tank filled, there will in fact just issue through the overflow tube the amount of condensed water supplied to the apparatus in the shape of steam through the injector.

Thermometers arranged just before and behind the preheater were adjusted in the position of rest at 94° and 96° C. respectively, these temperatures being maintained throughout the tests. The difference in temperature was thus 25° C., as stipulated in the contract. The difference in pressure, observed by means of a glass tube arranged on the rising tube below the steam air injector was found to be about 600 mm. water column.

The steam pressure in the steam air injector was 8 (Danish) pounds throughout the test; 282 kgs. of steam were condensed each hour in the preheater, and through the 7 mm. steam point 40 kgs. of steam per hour, that is, 12½ per cent. of the whole amount of heat supplied, was conveyed to the system. Assuming every kg. of steam to contain 530 calories, a total amount of about 170,000 calories per hour were supplied to the system.

Temperature tests were made afterwards when the pressure difference was shown to be constant, independent of the steam temperature, the latter varying at will from that of cold water upwards.

The amount of calories to be given off from the radiator heating surface (amounting to a total of 310 sq.m.) was augmented from 130,000 calories (as stipulated in the original drawing) to about 150,000, as, according to the experience gained by Messrs. Bruun & Sorensen, the above heating surface was susceptible of giving off this amount, while the pressure difference was fixed at 600 mm. water column.

In the course of the tests, the radiators were found to yield about 170,000 calories with a water temperature of 94°-69° C. In the case of the temperature being reduced to 85°-60° C. the radiators, according to calculations made, would yield about 144,000 calories per hour. Now on comparing the experimental results with calculations, the 600 mm. assumed and the 600 mm. water pressure actually found, the 150,000 calories assumed and the 144,000 calories stated, the 25° used and the water cooling of 25° as actually found, agree with one another so accurately as to fully warrant the use of the formula in question for calculating the pipes.

On the testing day, the temperature of the surrounding air was about 23° C.

As the water discharge pipe throughout the test would not give off any more than single drops of water, the steam may be taken to have been practically dry. The radiators have thus with these experiments yielded about 9.4 calories per square m. and per degree of difference between their mean temperature and the temperature of the air supply. However, as the doors to the heated chambers, in addition to the windows and all the air registers in the floors were opened, the speed of the air has probably been greater than under normal conditions.

THE ENGINEER AND HIS EDUCATION

By Professor William Kent

Dean of the Lyman C. Smith College of Applied Science, Syracuse University

Tredgold defined engineering as the art of directing the sources of power in nature for the use and convenience of man.

Engineering includes the science and art of construction in general. The civil engineer designs and constructs docks, harbors, canals, dams, water power and water supply plants, sewers, roads, railroads, bridges, foundations and structures of masonry and of iron and steel.

The mechanical engineer designs and constructs and equips and manages factories and power plants; designs and constructs engines and machinery.

The electrical engineer designs and constructs electrical machinery; designs, installs and manages electrical power and lighting plants, telegraph and telephone installations, etc.

A well educated and experienced engineer is not a skilled workman or artisan, but he is a man who knows how the artisan should do his work; he originates the plans for the work and he can advise the capitalist whether or not a proposed piece of work should be undertaken. He prepares instructions for a survey; instructs draughtsmen how to make a design, writes specifications for contracts, selects the kind of material and machinery best adapted for a given purpose, engages assistants, superintendents and foremen; writes prospectuses and financial statements. Such a man gets a part of his education in the engineering college, but the greater part he gets in the school of experience.

The engineering colleges of this country during the last thirty years have been eminently successful. They have turned out some thousands of young men, a large part of whom are now captains of industry, leaders of great enterprises, successful men in every sense of the word, men of broad culture and refinement, leaders of thought, in science, in business, and even in politics.

The essential condition of success of such men is that they throw away childish things early in the freshman year, and buckle down to four years of intense hard work. Many of them work in shops during their vacations, and therein gain experience, which helps them in their studies. The average student, in order to graduate, must make up his mind to spend at least nine or ten hours a day in study, in work in the shops, drawing rooms and laboratories and in the lecture and recitation rooms. Many young men make a mistake in coming to an engineering college, and they don't find it out until well along in their course. Many come imperfectly prepared, and their courage in entering, handicapped with conditions, is more commendable than their judgment. But to the student who, whether entering with conditions or not, begins his work with a sound body and a sound mind, with an honest intention to do his utmost to succeed, only the heartiest encouragement should be given.

Many of the best engineers are those, who, after graduating, took an apprenticeship course in some factory, where they made not over $10 or $15 a week for the first two years. The further progress of the young graduates depend not only upon how good students they were in college, but also on their other qualities: perseverence, industry, pluck, tact, and the art of making friends, as well as upon their actual achievements in practice and the good will of their employers which they gain therefrom.

THE PROSPECTS OF THE ENGINEERING PROFESSION.

During the last thirty years an industrial and economical revolution has taken place in the United States and throughout the civilized world:

Among the thousands of visible results of this revolution may be mentioned the following:

Vast increase of wealth.

Expansion of manufacturing industries.

Increase of railway and steamboat transportation.

Birth and growth of electrical industries.

Better housing of the people and better sanitation of cities.

The general cause of this revolution has been the application of the brain power of man in the utilization of materials and forces of nature. The human race has always, at least within historic periods, possessed brain power, but it is only within the last one hundred years than any large portion of that brain power has been used in the direction of utilizing the materials and forces of nature in an intensive manner by the aid of the steam engine and machinery, to produce wealth. It is only within the last thirty years that men have found how to educate that brain power in the most economical manner so as to make it capable of producing the great results of an industrial and economical revolution. This utilization of the forces of nature is the work of the engineer, and the training of the engineer in the most rapid and scientific manner is the work of schools of Applied Science or Engineering Schools.

Thirty years ago there were not over half a dozen of such schools in the country, and they turned out on an average probably not as many as twenty graduates in a year. There was then no great demand for them, but within the next ten years, when several hundred of such graduates had shown what results they could achieve in practice, often before they were thirty-five years of age, the public began to understand what an engineering graduate was, and soon there was a ready and ever growing market for his services. The demand for such graduates has been met by the organization of a hundred or more engineering colleges throughout the country, many of them as departments of universities. There are now probably not less than 15,000 students in these colleges, and the number is increasing rapidly.

There is apparently no limit to the future demand for young engineers. It will vary somewhat from one year to another according to the financial condition of the country in these years. In years of prosperity nearly every graduate of an engineering college of the first rank obtains a position immediately upon graduation. In dull years perhaps only one-half of the graduates will be located at once, but the remainder usually find their jobs within a few months. If there is any limit to the number of graduates that the country can absorb, it is not yet in sight.

The prospects of large financial success of the engineering graduate are the same as those of the graduate of the college of medicine or of law. The great prizes are only for the few. A comfortable maintenance is for the majority, and the failures are no greater in number than in the other professions.

An interesting exhibit of what 100 picked men between the ages of 27 and 43 in the electrical engineering business have done is given in a paper by Mr. George A. Damon, entitled, "The Opportunities in the Electrical Business," read before the electrical section of the Western Society of Engineers, March 18, 1904. Mr. Damon sent a letter of inquiry to 100 of the leading men in Chicago engaged in the various branches of the electrical industry. The summary of the results of his inquiry is as follows: Young men control the business. The inquiry was therefore confined to men between the ages of 27 and 45 on the theory that the older men are the product of a set of conditions that have passed away, while the youngest men are as a rule still engaged in a period of preparation. The 100 men are divided into groups as follows:

Class	No. of Men	Average Age	Average Income
Salesmen	7	33	$2,400
Sales Managers	11	36	3,400
Business Men	10	36	4,800
Sales Engineers	8	35	2,350
Electrical Engineers	16	33	2,800
Constructing Engineers	6	33	2,850
Electrical Experts	8	33	3,200
Operating Engineers	3	32	2,250
Operating Managers and Superintendents	10	34	3,550
Professors and Editors	8	34	2,500
Patent Attorneys	4	32	4,000
Consulting Engineers	9	40	6,400

Total number of men, 100. General Averages: Age, 33½ years; income, $3,440.

Classified in reference to incomes, the record is as follows:

	Men
Income over $10,000 per year	5
Income between $5,000 and $10,000	9
Income between $2,400 and $5,000	66
Income below $2,400	20
Total	100

Seventy-five per cent. of these men are college graduates. The average age of twenty men who are succeeding without a college education is 36 years, and their success measured by a monetary standard shows an income of $3,670 a year. The average age of sixteen graduates of one university is also 36. Their average income is $4,940, which shows a balance of $1,270 a year in favor of the college education. Mr. Damon says that there are in Chicago at least 100 more men whose incomes will average about the same as the first 100 selected. An effort was made to make the list representative and the men were selected on account of their positions without reference to their incomes.

It is to be observed of course that these are leading men. Nothing is said about the vastly greater number of men who are not leading, but there is no reason why an engineering graduate who has shown himself able to stand the severe four years' course in an engineering college, and also has the qualities other than those of scholarship which go to make success in business life, should not become a "leading man" within ten or fifteen years from the date of his graduation.

Pennsylvania Enacts Ventilation Law

We take pleasure in announcing that the ventilation bill introduced in the Pennsylvania Legislature during the late session at the instance of members of the American Society of Heating and Ventilating Engineers, and since amended, successfully passed both houses and was signed April 22 last by Governor Pennypacker.

Folowing is the full text of this important measure as passed:

AN ACT

Entitled an act for the purpose of governing the construction of public school buildings in order that the health, sight and comfort of all pupils may be protected.

Whereas, it is of great importance to the people of this Commonwealth that public school buildings hereafter erected by any board of education, school trustees or school directors shall be properly heated, lighted and ventilated.

SECTION 1. Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met, and it is hereby enacted by the authority of the same, That, in order that due care may be exercised in the heating, lighting and ventilating of public school buildings hereafter erected, no school house shall be erected by any board of education or school district in this State, the cost of which shall exceed four thousand ($4,000.00) dollars, until the plans and specifications for the same shall show in detail the proper heating, lighting and ventilating of such building.

SECTION 2. Light shall be admitted from the left or from the left and rear of class rooms and the total light area must, unless strengthened by the use of reflecting lenses, equal at least twenty-five per centum of the floor space.

SECTION 3. School houses shall have in each class room at least fifteen square feet of floor space and not less than two hundred cubic feet of air space per pupil and shall

provide for an approved system of heating and ventilation, by means of which each class room shall be supplied with fresh air at the rate of not less than thirty cubic feet per minute for each pupil and warmed to maintain an average temperature of seventy degrees, Fahrenheit, during the coldest weather.

SECTION 4. All acts or parts of acts inconsistent herewith are hereby repealed.

Machine Shop Ventilation

The absolute necessity for providing an adequate system of ventilation of public buildings is being recognized more and more each year, says *Canadian Machinery*, and as a consequence more attention is being paid to it. If it is necessary that public buildings have a good ventilating system, how much more is it necessary that a workshop, where the workmen spend so many hours of the day should have a good system. Fresh air is necessary to maintain the bodily vigor and alertness of the workmen. If instead of fresh air they breathe over and over again the same air, they will become exhausted and lose interest in their work. This good ventilation of shops is not only necessary to the health of the workmen, but it is also a source of economy, since the men keep the vigor necessary to perform their work with alertness and enthusiasm throughout the whole day.

Then, of course, in winter the shops have to be heated, and to secure the best system of heating and ventilating, one should depend on the other; that is, the system should be a combined system of heating and ventilating. A few words regarding the placement of the fresh air inlet and the foul air outlet, and best way of heating the air for the shops would not be out of place.

The air, as it is expelled from a person's lungs, is warmer than the surrounding air, and, therefore, tends to rise. However, since this air is laden with impurities, such as carbon dioxide, it is at the same temperature heavier than ordinary fresh air. Now, the air is expelled from the nostrils in a downward direction, and, therefore, will continue in that direction for a certain time, and at the same time is being rapidly cooled to the temperature of the surrounding air. Therefore, by the time its downward velocity is overcome, and its lightness has asserted itself and it begins to rise, in all probability it will have been cooled to the temperature of the room, and will again begin to fall.

From this consideration it would prove the best policy to have the foul air outlets near the floor, provided that a current of cold air is not entering at the floor, and there were a draft created. The necessity for this provision is quite evident, since the cold air is heavier than the impure air at the ordinary temperature of the room and, consequently, if both the cold air inlet and the foul air outlet were at the floor, and there were a draft created, the outlet would not be a foul air outlet at all, but a cold air outlet, since the cold air would form a steady stream from inlet to outlet.

If the outlet is to be at the floor, the inlet should be half way up the wall of the shop, where a draft should be created; perhaps the best way for an ordinary machine shop being by use of a fan. Then to consider the heating problem, it is very desirable, both from the heating and from ventilation standpoint, that the air as it enters should be raised to a certain temperature, not necessarily to the temperature desired for the shop, but high enough so that its heaviness will not cause it at once to drop to the floor. This heating can be done by having the air at it enters pass through a set of steam or hot water coils. After the air has entered it may be raised to the desired temperature for working in by direct radiation from steam or hot water pipes.

For very apparent reasons it is much more desirable that the pipes be some distance from the floor in a machine shop. The best of these reasons is that the tools are generally arranged near the windows and, therefore, near the wall, and if there were a row of steam or hot water pipes along the wall next the floor it would not be very comfortable for the operators of these machines.

In arranging a heating and ventilating system in a machine shop it is only necessary that a few of the common laws of ventilating should be followed, and that good common sense is displayed in the arrangement of the system, so that one good point may not be spoiled by the application of another which does not suit the system being carried out.

Some Labor-Saving Suggestions for the Foundry

Many articles have been written on labor-saving devices for the foundry, and important facts brought out by able writers, but the following observations, taken from the note book of H. F. Frohman, writing in *The Engineer*, offer some interesting suggestions upon the subject.

While visiting a certain foundry, Mr. Frohman speaks of a moulder he noticed using a perforated piece of tin to hold up the core in the mould.

"The idea seemed to be excellent, and the explanation of the moulder that the tin being perforated allowed the iron to alloy with it more thoroughly than would otherwise be the case seemed conclusive. The suggestion was taken up, and now

perforated tin chaplets are on the market in all sizes that are required. Foundries making very thin castings have found them exceedingly serviceable; in fact, they would not do without them if they could help it.

"Another simple thing is a core coating. This is used on a steel core, where a number of these may be used in one casting. The method is to dip the steel core into the coating, set it into the mould, and the iron will flow freely around it, making a perfect hole with neither a chill nor a blow.

"A mould-drying apparatus. This is a chiseling out of follow-boards and match coal in a dry sand mould. It is used with a direct flame from a torch, in connection with compressed air, the result being more economical and satisfactory than the old style.

"My attention was also called to the chiseling out of follow-boards and match parts, and after much study and experiment, with the assistance of the shop and the laboratory, a compound was gotten up which can be poured into a temporary mould, using the original pattern, and a satisfactory match made at one-tenth the cost of the old method. After setting, this match becomes almost as hard and as true as the iron itself, and makes an excellent follow-board or sand match, which becomes better as it gets older, and retains perfect parting.

"In many foundries where dry sand moulds are made, it seemed a hard problem to put a liquid blacking on the moulds evenly and well distributed. It seems that when this blacking is prepared for use, and allowed to stand a few minutes, the blacking settles at the bottom. This trouble is now obviated by using a compressed air blacking swab. This swab mixes and distributes the blacking very evenly over the surface of the mould, and can reach any part inaccessible to the hand. For this reason the result is much more perfect and the castings brighter, cleaner and better in every way.

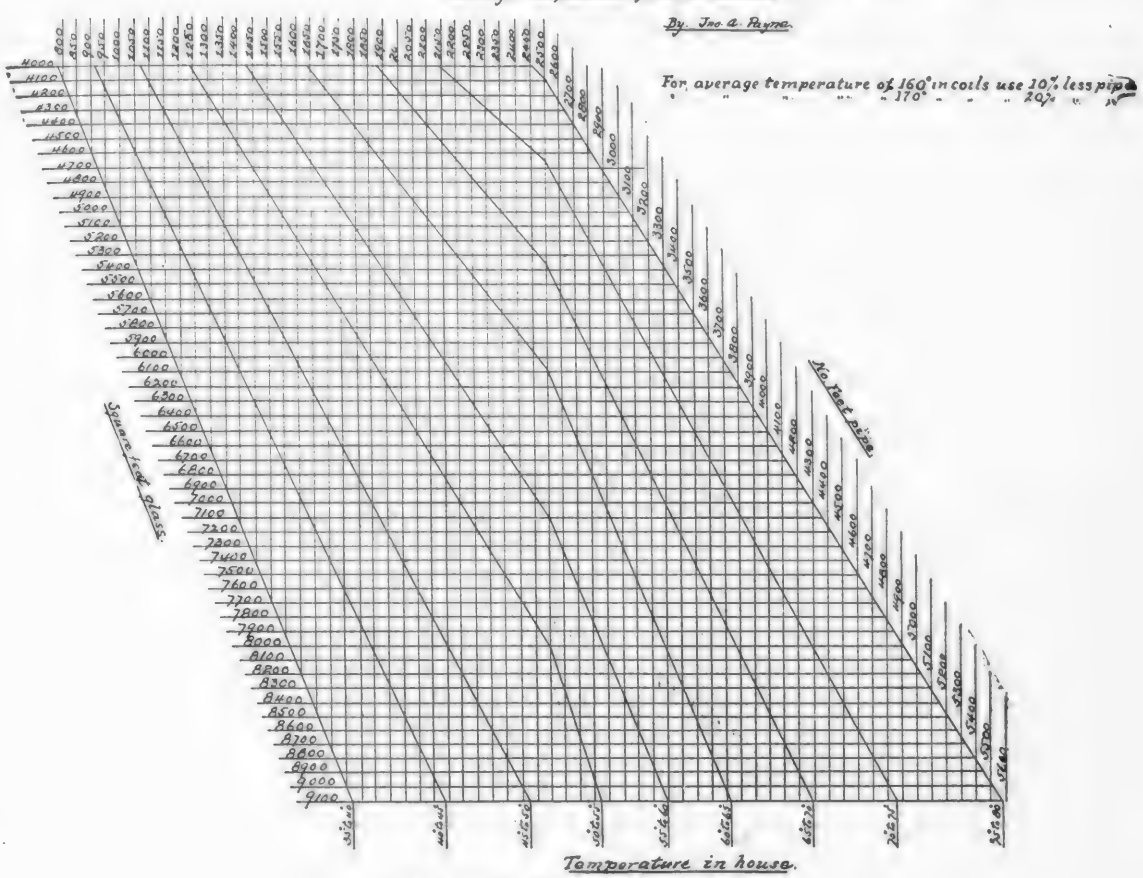


Table No 93 1000 To 9100 Sq Ft Glass
Curves showing lineal feet of 3½" Inside diam. C I pipe required for given amount of glass at given temperature in zero weather. Based on sides being 5 ft high composed of 2.5 ft of glass and 2.5 ft of wall, and an average temperature of 150° in the coils.
By Jno A Payne.
For average temperature of 160° in coils use 10% less pipe
" " " " 170° " " 20% " "
Square feet glass.
No feet pipe.
Temperature in house.

GREENHOUSE HEATING CHARTS
COMPILED BY JOHN A. PAYNE

Table N°5 100 To 1000 Sq. Ft. Glass.

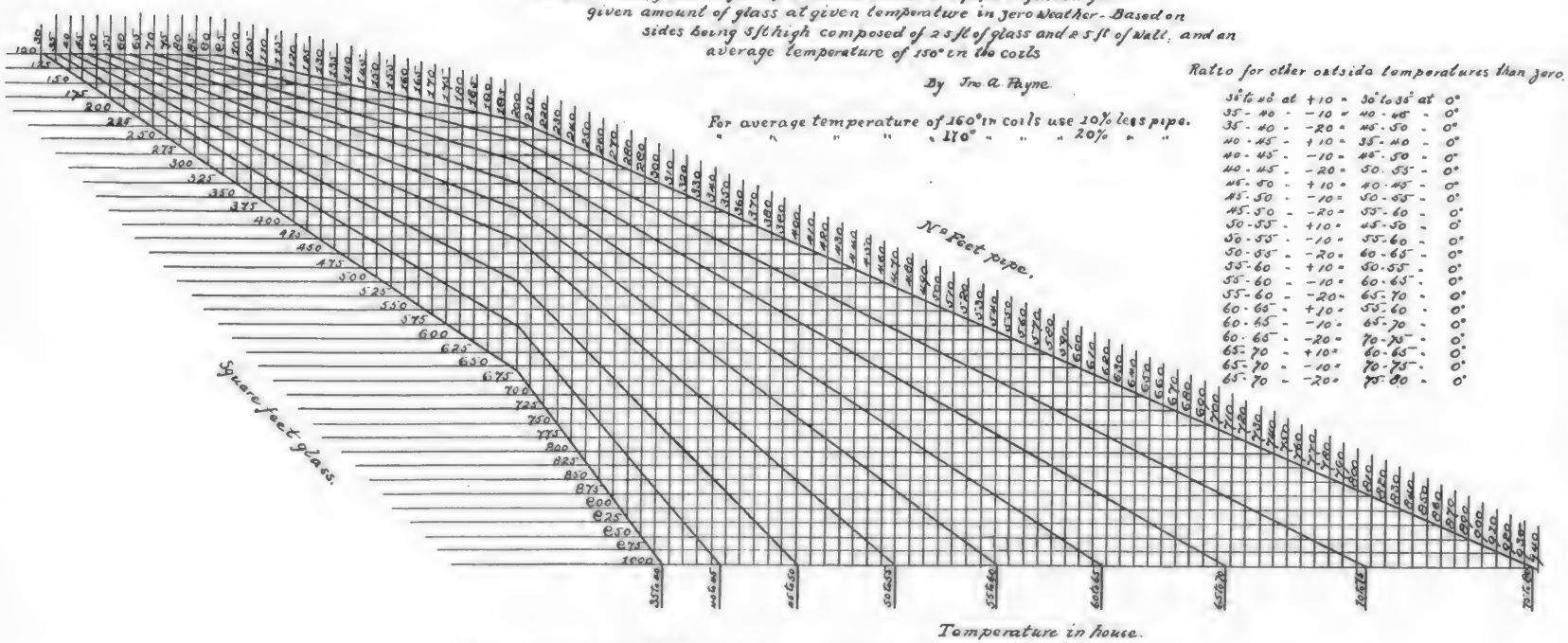
Curves showing lineal feet of 2" Inside diam W.I. pipe required for given amount of glass at given temperature in zero weather - Based on sides being 5 ft high composed of 2.5 ft of glass and 2.5 ft of wall, and an average temperature of 150° in the coils

By Jno. A. Payne.

For average temperature of 160° in coils use 10% less pipe.
" " " " 170° " " " 20% " "

Ratio for other outside temperatures than zero.

35° to 40°	at	+10	=	30° to 35°	at 0°
35 - 40	-	-10	=	40 - 45	- 0°
35 - 40	-	-20	=	45 - 50	- 0°
40 - 45	-	+10	=	35 - 40	- 0°
40 - 45	-	-10	=	45 - 50	- 0°
40 - 45	-	-20	=	50 - 55	- 0°
45 - 50	-	+10	=	40 - 45	- 0°
45 - 50	-	-10	=	50 - 55	- 0°
45 - 50	-	-20	=	55 - 60	- 0°
50 - 55	-	+10	=	45 - 50	- 0°
50 - 55	-	-10	=	55 - 60	- 0°
50 - 55	-	-20	=	60 - 65	- 0°
55 - 60	-	+10	=	50 - 55	- 0°
55 - 60	-	-10	=	60 - 65	- 0°
55 - 60	-	-20	=	65 - 70	- 0°
60 - 65	-	+10	=	55 - 60	- 0°
60 - 65	-	-10	=	65 - 70	- 0°
60 - 65	-	-20	=	70 - 75	- 0°
65 - 70	-	+10	=	60 - 65	- 0°
65 - 70	-	-10	=	70 - 75	- 0°
65 - 70	-	-20	=	75 - 80	- 0°



GREENHOUSE HEATING CHARTS. COMPILED BY JOHN A. PAYNE

"I might also mention the various designs of sand-sifters used in a foundry. By adopting these machines, many a dollar has been saved. There are now machines on the market which can riddle as much sand in one hour as formerly required the labor of two men for a whole day. It is also said that these machines temper the sand much more thoroughly. Facing sand may be prepared by them, and their use in the core-room is also highly advantageous for mixing sand with the various compounds, flour or resin.

"I remember, years ago, there was a certain foundry in Ohio, where they employed girls to make the cores. Should a stray salesman happen to wander in to see the foreman, these girls would spy him, and take all the conceit out of him that he ever possessed. I happened to be in that foundry again a few years later, dreading to approach that core-room, but to my agreeable surprise, found the young ladies wanting, and instead two boys operating two machines for making cores which formerly were made by not less than twenty-five persons. The machines were constantly fed, and as fast as the wheel could turn made satisfactory cores, true and round, and well vented, in fact faster than the moulders could use them.

"In this same shop, powdered resin was constantly used, and formerly two men were required to grind it by hand. Later on a machine was devised for powdering and pulverizing resin, which operated at a very low cost. It now runs for two hours, in charge of a boy, and produces more powdered resin than is used for a day.

"A word regarding the use of good facings and blacking may not be amiss. I have noticed that where formerly foundrymen used graphite by the pound, it is now used by the ton, showing conclusively that it is more economical to use high-grade plumbago to face a mold, at a few cents' cost, than to spend dollars in the cleaning room in cleaning and chipping castings. Furthermore, it is to the interest of the foundryman to purchase a grade of facings and blacking suitable to his respective class of work, and the very best is always the cheapest. As advancement has been made in the foundry, so it has in the manufacture of facings and blackings. The materials are turned out with the most modern machinery, and the raw materials kept under chemical control. The foundry-facing man now knows that he is furnishing the proper material for the particular purpose.

"Many other simple labor-saving devices could be enumerated as having come under my notice, and all of them would not only become sources of economy alone, but also result in considerable profit to the foundryman."

Liquid Fuel and Oil Burners

By George G. Bennett

In view of the repeated assertions being heard as to the passing of coal as a fuel, the following abstracts of a paper read at a meeting of the Ohio Society of Mechanical, Electrical and Steam Engineers will prove of interest:

In a previous paper on this subject, read at Canton, in November, 1903, I stated that when burning oil as fuel, with the aid of a steam jet, I did not believe that air is required in any quantity whatever to aid the combustion of the oil, and that the oxygen contained in the steam is sufficient to take care of combustion. I was taken to task by a few of the members for making these assertions, which may appear rather startling. Nevertheless, they are true: this fact having been demonstrated by experiment to my own satisfaction a few years ago.

For the benefit of those who did not have the opportunity of hearing the paper, especially that part pertaining to the absence of air in a furnace when burning oil with the aid of a steam jet, I shall take up a portion of the subject again, and incidentally might state that since then I have found no reasons for changing my opinion. Before commencing this paper I read even more fully the reports of tests of liquid fuel and burners made by the chief of the bureau of steam engineering, Rear-Admiral George W. Melville, U. S. N.

Of the fourteen tests made, I find that the best result obtained under natural draft was in test 3—viz., 765 pounds of oil per hour, evaporating 14.43 pounds of water per pound of oil, and maintaining as high an efficiency, if not higher, than in test 8, in which 3.303 pounds of oil (10.77 barrels) per hour were used under forced draft. This evaporated only 10.77 pounds of water per pound of oil. With this great amount of air, the report says, "the smoke was very thick and black throughout the test." The draft opening during this test represented 642 square inches, while in test 3, the draft opening contained only 124 square inches, which resulted in higher efficiency.

We know that dry steam under pressure is a true gas, and a good supporter of combustion, and when decomposed by some suitable arrangement the gases burn with intense heat, but some form of carbon must be used to effect the decomposition. We also know from experience that this decomposition actually occurs when burning oil with aid of steam.

It has been demonstrated that 1 pound of oil will evaporate at least 15 pounds of water. So that the percentage of steam

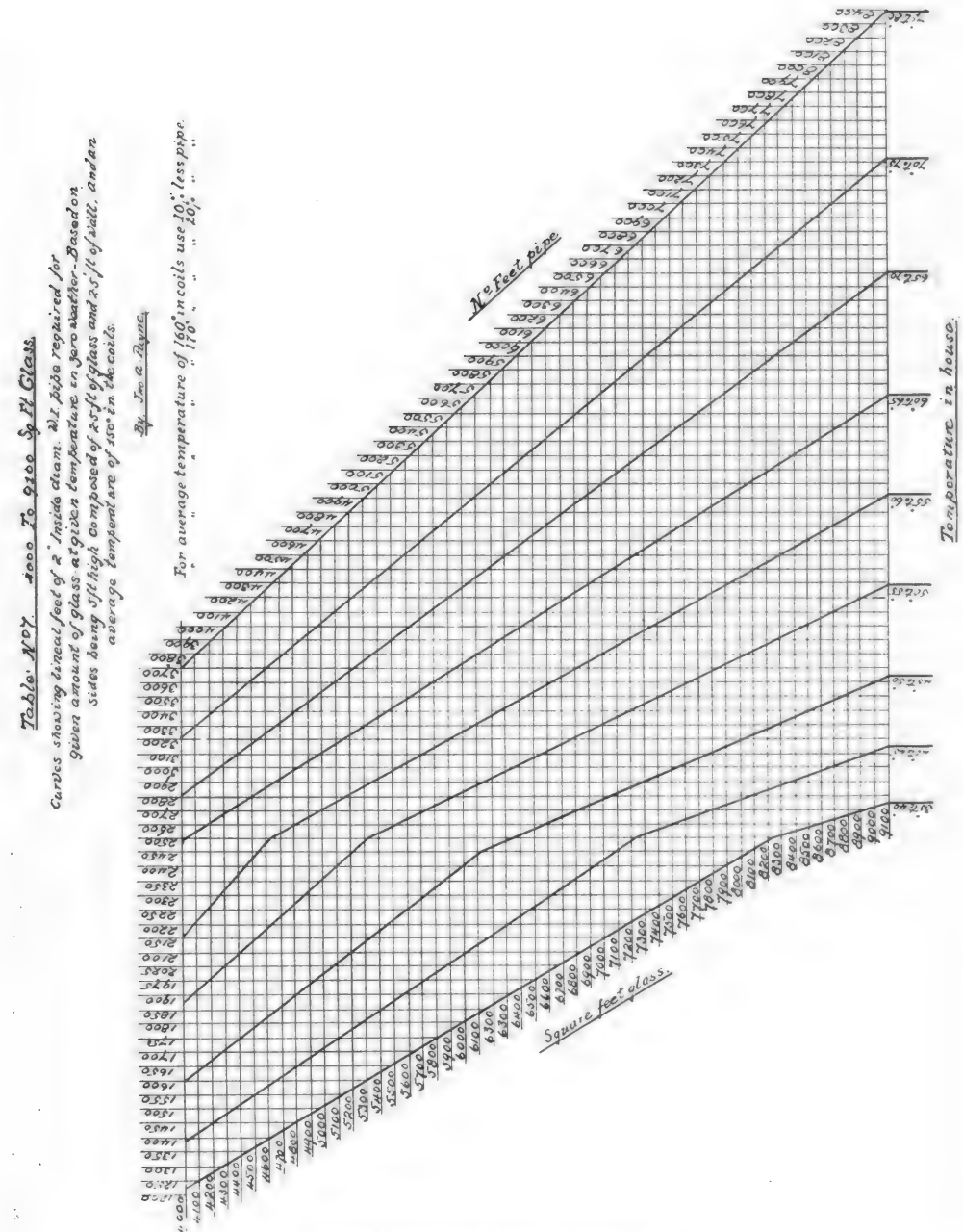


Table No. 1 1000 To 2100 Sq. Ft. Glass.
Curves showing lineal feet of 2" inside diam. pipe required for given amount of glass at given temperature in zero weather-Boston. Sides being 15 ft high composed of 25% of glass and 75% of wall, and an average temperature of 150° in the coils.
By Jno A. Payne.
For average temperature of 160° in coils use 10% less pipe
" " " " 170° " " " 20% " "
No Feet pipe
Square feet glass.
Temperature in house.

GREENHOUSE HEATING CHARTS
COMPILED BY JOHN A. PAYNE

used to atomize and force the oil into the furnace is very small in proportion to the steam generated, probably 2 per cent. would be very high. Not only this, but we are always sure of complete combustion and of no waste of fuel. The flame may be intensified by merely operating a valve controlling the supply, either the steam or the oil. In the other case, when air alone is used for the combustion of the oil, we have the cost of installing air pumps, auxiliary air superheaters, which require extra fuel to operate, and not only this, but the amount of air required is extraordinary. This is just where the trouble occurs, viz., in not being able to distribute the air where it is required most, and the production of black smoke is the result. Those who have experimented with air will readily agree on this point.

With the use of steam there can be no uncertainty, for complete combustion can be maintained at all times. There is no such thing as a smoky furnace, no trouble with the tubes or flues stopping up with soot, no air to regulate, the burner can be made automatic, and as long as the steam and oil supply is maintained at the correct standard no further attention is necessary. Some of the advantages of liquid fuel are: Its concentrated form, economy of handling, increased evaporative efficiency, cleanliness, abatement of the smoke nuisance, reduction in depreciation account, reduction in repair account, reduction in sundries account, and efficiency in emergency.

The efficiency of oil over that of our best coal, pound for pound, is from 30 per cent. to 40 per cent. In regard to cleanliness it has no competitor; no dust or dirt from the handling of ashes or coal. There is also a large saving in paint, brooms, tube cleaners and waste. The great cost of installing smoke consumers in cities where the smoke nuisance is experienced, may be ignored, because there will be no necessity for complying with the law, smoky chimneys will be a thing of the past. When burning oil a smoky chimney is good evidence of imperfect combustion.

CHANGING FURNACES

The time required to convert a furnace from coal to oil burning and vice versa, is very short, not over two hours at best. The methods I have always used in changing of a furnace from coal to oil burning is to clean all the ashes and clinkers off the grate (it is not necessary to remove the grates), then cover the grate with a layer of firebrick; over the firebrick spread a layer of ashes or sand (common clay will do if nothing better be found) 2 inches or 3 inches in depth, which will be found sufficient. To change back to coal requires only a very few minutes.

For the information of those who are not aware of the amount of oil used at the present time for fuel purposes, I will enumerate a few of the large corporations who have adopted, or who are about to install, oil burners. I believe California has made the greatest strides in this direction, due, I presume, to the scarcity of other kinds of fuel, while petroleum is very plentiful. In 1901, the city of San Francisco alone spent $10,000,000 for coal, but at the present time this coal bill has been cut in two. More than 250 establishments, or I might say, large factories, have discarded coal and adopted oil. It is also used in a very large number of houses. The fact of the matter is, California is using more oil to-day than the state produced in 1901.

In regard to the railroads, the Southern Pacific is burning oil in about 250 of its locomotives, and the company intends to equip its entire system for the use of oil. The Santa Fe is burning double the amount of oil used by the Southern Pacific. The Houston and Texas Central Railroad Company is using Beaumont oil for fuel. The Kansas City Southern Railroad Company is now equipping its locomotives with oil burners. The Trans-Caspian Railroad is using oil on 1,600 miles of road. In Russia oil fuel holds full sway, both on railroads and steamships. For 2,000 miles along the Volga boats are propelled by means of oil. The amount of oil used in Russia is enormous, being about 800,000 tons a year. A fleet of nearly forty steamers, operating between London and Borneo, burn nothing but liquid fuel.

In many shipyards, both in this country and Europe, steamships are being equipped with oil burners. I believe I have quoted enough to show that oil as fuel is coming into strong competition with coal, and in countries where coal is scarce liquid fuel will take its place.

INFLAMMABLE QUALITIES OF OIL

One great objection urged against the use of oil as fuel is due to its inflammable and explosive qualities. This, no doubt, arises from lack of knowledge as to its nature because those who have had experience with crude oil know differently. The fact of the matter is, crude oil is very hard to ignite. As an illustration, I filled a water pail full of crude oil, and then threw into the pail a shovelful of red-hot coals. The result was similar to throwing them into so much water. I have also taken a handful of burning waste, and a lighted pine torch, the results, however, being the same as with the live coals. Even a red-hot bar of iron had no effect. This proves that the oil is not as dangerous as many consider it to be. If you wish to put out an oil fire, do not attempt to extinguish it with water, for water has a tendency to intensify the flame. It must be smothered out either by earth or manure.

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The Board of Directors announces the appointment of Mr. Arthur S. Armagnac as Editor of THE HEATING AND VENTILATING MAGAZINE, taking effect May 1st, 1905.

Mr. Armagnac is well known to the trade through his connection with the National Association of Master Steam and Hot Water Fitters, having met with pronounced success in the editorial management of the OFFICIAL BULLETIN of that body.

THERE are two classes of trade papers—at least two. In one class are those of which a writer has said, "from year's end to year's end they never find anything to criticize, or never find anything which calls for condemnation;" in other words, papers that are studiously colorless one way or the other, rather than constructive and elevating.

The other class includes those which the same writer has characterized as being "not afraid to criticize that which they know and believe to be harmful, or not fearful of taking any decided stand lest the interests of some advertiser be jeopardized, and thus the business interests of the paper suffer."

As between these two classes it may be well to state that this magazine will maintain a stand definitely and permanently with the latter. As the only journal in this country devoted exclusively to the science of heating and ventilation, its true mission would fall far short of being realized if, for a moment, it sacrificed any opportunity of advancing the best interests of the industry to so short-sighted a policy as that of serving its immediate purposes, first last and all the time.

IN this connection the improved conditions that prevail in every department of the heating and ventilating trade are a matter for comment, as they constitute one of the gratifying features of the modern development of trade. There is today probably less of what is meretricious, wrong and liable to degrade the heating and ventilating industry and thereby affect its prosperity and standing than at any other time in its history. This is far from saying that we are within striking distance of the millennium. We are still a long way from that, but every step taken towards it will have the outspoken and hearty support of this journal, as a movement in the opposite direction would call forth comment.

WHILE the professional societies and trade associations have done much in securing this improved condition of affairs, much also has been accomplished by the

trade papers. In the last analysis, it is through these mediums that the man at both ends of the line, so to speak, judges of the various movements set on foot and their effect. After all, most of us who do not come into frequent contact with those actively engaged in the improvement of trade conditions are forced to rely largely on the trade press for information as to the real effects being produced, and though, perhaps, not immediately interested in what is transpiring elsewhere, we are, nevertheless, always more or less influenced by such reports. It is, therefore, essentially the function of the trade paper to present accurately the progress of these movements, neither exaggerating the results achieved nor glossing over the weak spots to be found. As regards the aims sought and to be sought, it will be the aim of this journal to reflect the opinions and judgment of the most conservative, yet progressive, minds in the heating and ventilating profession.

ONE of the practical puzzles that confronts architects, contractors and engineers is the disposition of the catalogues and handbooks of various size and design that come both from manufacturers and jobbers. Their number is on the increase, and any arrangement of them for easy reference presents a problem in mechanical engineering that baffles a large part of the profession. As a result, in a majority of offices this literature either lies in a promiscuous pile in a corner of the room or is set up, each book on end, on a shelf sufficiently high to accommodate the highest, where it quickly falls into disorder with use. Many of the catalogues published nowadays represent the expenditure of money that is out of all proportion to the fate that overtakes them at the bottom of a dust-covered pile, a fate owing, in many cases, to their cumbersome and inconvenient size.

It is surprising that in these days of standards and uniform action, the houses that publish elaborate catalogues have not before now adopted a uniform size or sizes for their publications. We are aware of the efforts that have been put forth along this line, but it remains a fact that the present appearance of the average catalogue shelf is a sight to behold and the conditions are constantly growing worse.

SOONER or later the question of establishing a standard size for catalogues and hand-books will have to be brought up for decision. In some quarters it has been suggested that a card index system be adopted and we know of at least one important house that is now using this method. Personally, we believe committees selected from the different parties concerned could very readily arrive at a standard satisfactory to all, considering not only the adaptability of the various publications for filing on shelves and elsewhere, but, also, their convenience for use on the sketching table. Under the present system, or lack of system, there is absolutely no criterion for the guidance of the publisher. Every size imaginable is at his disposal, often resulting in the devising of a form which, if possible, is a trifle different from anything that has gone before. We invite expressions of opinions from our readers upon this subject.

THE heating and ventilating engineers of Pennsylvania are to be congratulated on the passage by the Legislature of their ventilation bill which, as we stated in the last issue, had been introduced at the session just ended. We publish the bill in full in another column. It was signed April 22 last by the Governor of Pennsylvania and is now inscribed upon the statute books of the State. By this action Pennsylvania joins New York and Massachusetts in the State control of the ventilation of public buildings.

IN this issue we continue the publication of Mr. John A. Payne's interesting charts on the subject of greenhouse heating. There are six charts in all, those already published having appeared in the June, July and December, 1904, issues, respectively. As was stated in the June issue, the charts were made to meet the conditions found in connection with greenhouse heating with the outside temperature at zero, and have been found reliable in actual practice. A table has been prepared, to be found on Chart 5, by the aid of which the figures on each chart can be adjusted to outside temperatures other than zero. Mr. Payne, in his introductory article regarding the charts, referred to certain exceptions that would naturally be met with under unusual conditions.

He said, for instance, that in the case of especially well-built houses the amount of surface may be reduced about 7 per cent. Where the cubical contents of the greenhouse are large in comparison with the glass surface the amount of surface given in the charts may be correspondingly reduced. It is safe to say that for a house 25 feet wide and 75 feet long, with eaves 10 to 12 feet high, the surface specified in the charts may be reduced fully 10 per cent.

It also should be noted that the amount of surface given in the charts is based upon the assumption that the water in the pipes will have an average temperature of 150 degrees. If this temperature is increased to 160 degrees the amount of surface may be decreased 10 per cent. If it is increased to 170 degrees, the surface may be decreased 20 per cent.

Boiler Scale

When the deposit of scale on a boiler is very thick about the best way, in the case of large boilers, is to break it off with a hammer and cold chisel. Some of the anti-scale compounds are not only effective in keeping the boiler surfaces clean, but they have a tendency to soften the scale already deposited. The use of two or four quarts of kerosene in the boiler once a month or oftener, when firing hard, will give good results. Of course the best way of all is to use waste that contains only a small amount of mineral matter. In large plants, where the waste is very hard, purifiers can be used to advantage.—*The American Florist.*

It is officially announced that the midsummer meeting of the society will be held in Chicago, July 7 and 8 next. James Mackay, of the Kellogg-Mackay-Cameron Company, is chairman of the local committee, which is made up of the society's membership in the Windy City.

It is officially announced that the place and dates for holding the Seventeenth Annual Convention will be Atlantic City, N. J., June 12, 13, 14 and 15 next. An unusual growth in the association's membership during the past year indicates that a record-breaking attendance may be looked for at the convention.

TOPICS OF THE TRADE

The president of one of our largest boiler companies struck the metropolis one day about a month ago just three hours after the Subway strike had been declared. He was, for once, merely passing through the city, but the tickets for the continuation of his trip were safely deposited in a down-town vault. He came out of the Grand Central station in time to see the packed and jammed trolley cars go crawling by with the passengers almost literally hanging by their eyelids. As the situation gradually dawned upon him he turned to the cab stand and then realized that he had not been greeted by the customary cry of "Cab, cab." In fact there was no cabby in sight. The seriousness of the situation grew with every passing moment until finally the dismal alternative confronted him of walking downtown or of going without his tickets. The company of which the gentleman in question is president has had its fair share of business during the past year and is said to have shown a comfortable balance on the right side of the ledger, but there was not enough money in the treasury that day to buy a ride from the Grand Central Station to City Hall. The walking, however, was good, and that morning there could be seen the odd spectacle of the president of a millionaire corporation trudging it down the three and one-half miles of cold, hard pavement that separated him from his destination. He says New York is the longest city in the whole wide world.

The steam fitting and plumbing trades are sometimes confused in the minds of the unknowing, but it is seldom indeed that so perfect a harmony of thought is established between them as that which led to their selecting the same identical dates for holding their annual conventions this year. The only feature lacking was that their choice fell upon different cities. It was only through some rapid work, following the discovery of the choice of the same dates, that enabled the Master Fitters to make their convention date a week later so that those having interests in these organizations could arrange their plans to attend them both.

Some comment has been heard as to the cause of the popularity of Atlantic City for the steam fitting fraternity, but in most quarters the decision to hold this year's convention in the same place and at the same hotel as that chosen last year is declared to be a clever stroke on the part of the Board of Directors. Atlantic City is not only a popular resort in itself, but is now familiar to the trade at large. Everyone knows the way there, what kind of accommodations he is going to get when he arrives, and what he is going to see and do during his stay. This should prove a great drawing card and it undoubtedly will.

The choice of Chicago as the midsummer meeting place of the Heating and Ventilating Engineers is also a good one, but for another reason. Contrary to the belief held in some quarters, Chicago has many attractions for the summer visitor and, like New York at some periods during the warm weather, is at times an ideal summer resort. Besides being the home city of many of the Society's members it boasts, as Mr. C. V. Kellogg related at the Society's last dinner, of producing sixty per cent. of the house heating goods sold in this country.

CORRESPONDENCE

Low Pressure Gravity Systems and the Ventilation Laws

The following correspondence between a western heating firm and Mr. C. B. J. Snyder, architect of the department of education in New York city, regarding the efficiency of a low pressure gravity system for heating school buildings so as to comply with the ventilation requirements in Massachusetts, New York and Pennsylvania, will be read with interest by engineers generally, who are devoting much time and thought to the best methods of heating and ventilating these buildings in accordance with the present laws. The firm in question wrote as follows:

Dear Sir: The old Smead system which was so successfully fought and crippled a number of years ago went to the wall, and, through this section, was succeeded by a number of their understudies who have dispensed with the gravity hot air system and are now using a group setting for their hot air furnaces and using a fan driven by water motor, gasoline engines, or electric motor to force the air into the rooms and in some places and under favorable circumstances, they are meeting with fair success, but in many places they fall down sadly in results, both for warming and ventilation.

They are beginning to force competition much more strongly than formerly, owing to a sort of combination between themselves, so that frequently there will be three or four hot air fan systems figured, and it is largely a pooling of interests among themselves and a combination against the steamfitters.

In recent competition they produced newspapers with large red head-lines, giving an account of a boiler explosion at Brockton, and undertaking to prejudice the board against anything that used a steam boiler. They also made the further statement that since the laws of New York, Massachusetts and some other states required 30 cubic feet of air per scholar per minute, that it had shut out the low pressure gravity system of direct and indirect radiation for warming school buildings, for they claimed it was impossible to properly warm and ventilate a building by low pressure gravity steam without the use of a fan. Now, while we know that with a fan system more positive results may be obtained, we do know from actual experience that satisfactory results can be obtained from low pressure gravity, using liberally of indirect radiation, and on a great many school buildings having from 4 to 10 or 12 rooms and only the average kind of janitorship and intelligence to care for such an apparatus, it really means that many of the country towns and villages will either adopt the hot air system, with possibly some fan combination, or else it will be low pressure gravity steam, and a school board will not consider favorably the steam fan combination, and such a combination figured for them will bring the price so much higher than the hot air fan, that it helps them to secure more easily the adoption of their hot air fan system.

The average size of the school rooms in most school buildings containing from 6 to 12 rooms is, for the school rooms, from 9,000 to 11,000 cubic feet, with two exposed wall surfaces, and perhaps one larger room as a high school or assembly room containing 14,000 to 18,000 cubic feet. Besides this there will be from one to three smaller teachers' rooms, the closets, the halls and two or three basement rooms wanting some direct radiation, and if a good strength of indirect can be used for the school and class rooms, with direct radiation or ornamental wall coils against the exposed wall surface, our experience is that we cannot only thoroughly ventilate, but thoroughly warm the building by low pressure gravity.

No doubt in your business you have run across many school buildings that are warmed with low pressure gravity and secure the ventilation required under the state laws. Will you kindly advise us the names of a few of such buildings, and if possible what strength of indirect for ventilation is usually figured in order to comply with the law as to ventilation.

A certain committee having in charge the erection of a new school building has at the suggestion and invitation of the representatives of the hot air fan and the steam fan systems, been out on a junketing trip and are said to be quite strongly of the opinion that no proper and reliable ventilation can be secured, except by using the same fan system. They say that during cold severe winter weather no doubt a low pressure gravity job would give quite satisfactory results, but when the weather was warmer, say about 40 or 50 degrees outside, that no proper and reliable ventilation could be secured. The matter comes up for consideration the 15th of this month, and if you can enlighten us somewhat as to your observations and what is figured in your section we will greatly appreciate it.

Michigan, April 5, 1905.

ANSWER BY MR. SNYDER.

I have not used any fan furnace heating system because where a job will warrant putting in a fan it will also warrant the introduction of a steam plant, but I am of the opinion that if heaters are to be used the only way their full efficiency can be obtained is through the use of fans.

The question seems to resolve itself into a desire on your part to have some one strengthen your arguments that a low pressure gravity job would give satisfactory results for ventilation when the weather was forty or fifty degrees, without the addition of a fan.

Personally, I believe it is absolutely impossible to obtain a uniform supply of warmed fresh air, 30 cubic feet, per pupil per minute, without the use of mechanical means.

It would appear to me, if you will permit me to make a suggestion, that the case you state seems to indicate that what the people in your section want is the fan heating system used by your competitors, and if this be so and you are in the business, why not get on to the "band wagon" and give them what they want? The reaction will come some day and in the meantime you will be "doing business."

Water Pans and House Heating.

Prof. William Kent, of Syracuse University, writes us as follows, anent the discussion now agitating the minds of a portion of the heating trade, as to the possible passing of the water pan in house heating. It is only fair to Professor Kent to state that his letter was in reply to an inquiry upon the subject:

Editor HEATING AND VENTILATING MAGAZINE:

It appears that some people are saying that most of the diseases that flesh is heir to are caused by insufficient moisture in the houses. Then when any one gets sick they are sent to the Adirondacks or Arizona to find a dry atmosphere.

It seems that the warm air furnace men are ceasing to build water pans in their furnaces at the same time that other people are inventing and trying to put on the market air moistening devices and are trying to alarm the public on the question of deficient moisture in air to help sell their devices. The last year and a half I have lived in a house heated with a furnace without a water pan. Before that for many years I always had a water pan in the furnace or under one of the registers. As a result of experience both with and without water pans I don't know which to recommend.

Yours truly,

WM. KENT.

Syracuse, N. Y., March 22, 1905.

Ventilation of Tunnels

Editor HEATING AND VENTILATING MAGAZINE:

I noticed in your last number an article by Albert A. Cary on the ventilation of tunnels and subways, in which he described a system whereby he proposed to extract the smoke and gases by means of fans expelling them through ducts rising 100 feet into the air.

Aside from the unsightly appearance of a number of these factory chimneys along the line of the tunnel, I would suggest, as an improvement upon this scheme, an arrangement for forcing pure air into the tunnel at points as far away as possible from the outlet. The smoke and vitiated air would thus be forced through the outlets which I should construct only a few feet above the surface. The presence of the buildings on both sides of the street obviates, I think, the possibility of the occupant suffering to any extent from the smoke, etc., arising from the tunnel. The system I have described is in operation in many of our largest mines, and the practical operation of it can be seen by New Yorkers in the tunnel now building under the East river.

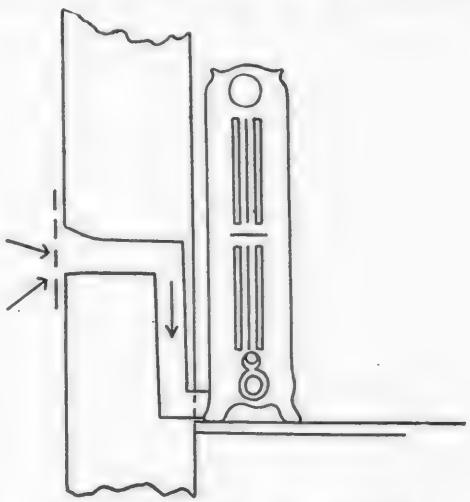
J. D. JOHNSON.

New York City, April 15, 1905.

Ventilating Radiators

Editor HEATING AND VENTILATING MAGAZINE:

I read with pleasure Mr. Sutcliffe's article on the "Science of Ventilation,"



Sketch showing Cold Air Connection to D.I.Radiators

published in your March number. The type of ventilating radiator he illustrates is a familiar one to engineers on this side of the Atlantic. Many of us, however, have found difficulty in making this radiator work effectively, owing to the fact that the flue for the intake of air is located on or below the floor. Cold air will not rise unless forced, and many radiators of the type referred to will fail to circulate freshly-warmed air because there is no adequate provision for lifting the cold air that comes in from the outside. In the sketch shown herewith I have illustrated a method I have found

successful for obviating this difficulty. The cold air being taken in at a point midway between the floor and the top of the radiator falls easily to the bottom of the flue where it is propelled upward again by the pressure of the air behind.

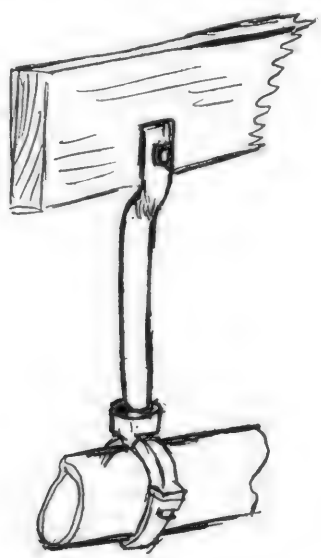
I have recently equipped a large building with these attachments, and in every case a constant current of fresh, warm air is obtained. GEORGE L. GRAY.

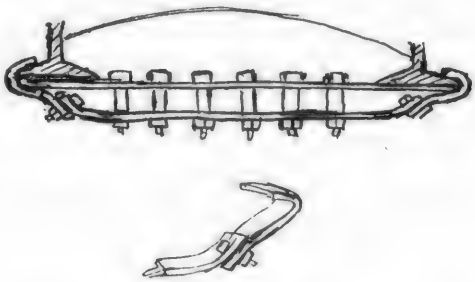
New York.

Pipe Hanger

Editor HEATING AND VENTILATING MAGAZINE:

The steam fitter is rarely ever puzzled for a pipe hanger, but sometimes the creations are quite bright and neat. Hangers to save labor and to be durable enough to withstand the strain are more sought after than those with rollers for expansion. Fig. 1 shows a method employed in non-fireproof buildings in order to save time that would be consumed in drilling a vertical hole in wooden floor beam. The end of a piece of 1-inch pipe is flattened out and a hole drilled to receive a lag screw. A thread is cut on the lower end and is made up well into a sectional hanger. Fig. 2 is a multiple pipe hanger accommodating several pipes of one diameter, and is used in fireproof constructed buildings. It consists of three parts, upper and lower bars and a pair of lugs, ½-inch bolts and nuts are used as separators, enclosing ¾ x 1-inch nipples, which serve as vertical rollers, providing for expansion and contraction of pipe. The lugs are made to grasp ends of top bar. The lower bar is slightly curved at each end and has a hole at each end corresponding to one in the lower end of each lug. The lug is bent in such a manner as to hold both upper bars fast to beam and also to support lower bar. This hanger does good service in a basement, warehouse or public school. T. F. MCMACKIN.





New York City.

NEW DEVICES

New Devices

The Brennan Circulating Hot Water Valve is a new appliance for hot water heating purposes. It is said to be the only one which permits the radiator to be swung away from the wall for the purpose of finishing, cleaning or repairing without interfering with the circulation of the heating medium. It is also claimed that the apparatus can be put in complete, including the connecting of radiators, before the building is lathed and plastered, and can be run either complete or in parts while this work is being done. Because the circulation is positive it is thought that a higher degree of temperature is obtained, and as the entire surface of the radiator is heated, short circuiting is impossible.

Kernan Welcome Registers.

The Syracuse Stove Works, Syracuse, N. Y., have for months been making a great specialty of their registers.

One of their newest products is a plain lattice design. This is a pattern for which there is a good deal of demand from architects, particularly for large buildings where a plain construction is desired.

The manufacturers are prepared to promptly furnish not only the regular sizes of this design, but to make it in special sizes and to electroplate registers so as to match any finish of hardware or of interior decorations.

This and other register designs are described in a little catalogue which will be sent on application to the manufacturers.

About the Trade Journal

There is perhaps but one field of endeavor in which there is given the public generally something for nothing, and in many instances a premium is given also that this product may be accepted. It is that of advertising. Here not only are thousands, yes, millions of dollars of value given away every year, but there is as much more spent in making the gift attractive. If John Jones, the grocer, wishes that his name and business be given a permanent position in the houses of his friends and neighbors, he does not only print them, but he also pays from ten to a hundred times the cost of the printing for a fine art calendar upon which to place them. This is the rule and at first glance one would scarcely look for an exception to it. The public which has advertising thrust upon it is scarcely the public that one would look to as a purchaser of this same advertising matter.

Yet there is an advertising medium that the public, that is the public that is interesting to the advertiser, buys and buys principally for the advertising that appears in it. This is the trade journal. It is admitted that this is a broad assertion and, if made only by the publishers of trade journals, might be open to some degree of question. But there is another evidence of this, that which is gained by investigation among the subscribers of the papers themselves.

This from the standpoint of the advertiser: He secures from the time of the first insertion of his advertisement an audience that is vitally interested in his commodity. They are people who are interested in it not because it is a commodity that they want for their own use, but a commodity from which they make their livelihood. Their search for advantage is keen, for upon securing it depends their success and existence. Every advertisement shown is looked at closely; the advantages of the article advertised are considered, and the statements made by the advertiser receive critical attention. This is what he wants. It is presumed that the article advertised has merit, without it all advertising is useless, but granted that there is merit in the proposition the attention that it receives through exploitation in the trade journals bring the most prized results of any advertising campaign, direct returns, the kind that can be traced.

There are two sides to be considered in a matter of this kind. The advantage of the medium to the advertiser, of which we have spoken and also to the party to whom the advertisement is directed. Is this advantage mutual? A moment's consideration will demonstrate the correctness of an affirmative answer.

In the first place, in the trade journal that is devoted to the interests of the business of the reader, the advertisements that appear will naturally be of a sort that will directly appertain to his business. It will in no case be irrelevant. Then, too, the advertising is bound to be interesting to him for the reason that has been previously stated—his business success depends upon his taking every possible advantage, and the advertising columns of his trade journal give him at least the chance to see an opportunity if they do not show him the opportunity itself.

It is not the reading pages of the paper only that contain hints and suggestion as to what may be the newest developments in his field of industry; indeed they are secondary in this respect to the advertising columns, for it is here, both in text and illustration, that he must look for the very newest designs, or the very latest product.

The manufacturer and wholesale dealer using a trade journal to exploit their product are not going to spend money to show and talk of their general run of goods. They are, on the contrary, going to devote their space to demonstrating the merit of their very latest and best production. As all other advertisers are doing exactly the same thing, the result is that every issue of the paper is a review of the latest and best product in the line of business in which the merchant is directly interested. To quote instances of this would take up too much time and space and would in addition be entirely unnecessary. The experience of the reader, be he either a buyer or seller of merchandise, will, if he thinks of the matter, give a sufficient number of them to prove the truth of the assertions.—H. Walter Scott in *Merchants' Record and Show Window.*

British Standard Pipe Flanges

Engineers and others using flanged pipes for steam and water services will be interested in the series of tables contained in a report issued by the Engineering Standards Committee, and published in the *Plumber and Decorator.* If universally adopted, the present report will have the effect of obviating the disadvantages due to the unnecessarily varying requirements of consulting engineers, which in the past have involved alterations to patterns and specially cast pipes, with consequent delays and increased prices.

The only essential departure from general practice is to be found in the decision that the number of bolts shall in all cases be a multiple of four. This means that for certain small sizes of pipes eight bolts will be employed for some pressures in place of six as heretofore, while in the case of low-pressure pipes the six bolts will give place to four. It is believed that the advantages of the principle recommended are quite sufficient to counterbalance any possible disadvantages. For cast-iron pipe flanges, all the diameters necessary come within two

series—the first relating to the "Low-pressure Standard," for steam pressures up to 55 pounds and water pressures up to 200 pounds per square inch, and the second to the "Intermediate-pressure Standard," for steam pressures from 55 pounds to 125 pounds per square inch, the "High-pressure Standard," for steam pressures from 125 pounds to 225 pounds per square inch, and the "Extra High-pressure Standard," for steam pressures from 225 pounds to 325 pounds per square inch. Attention should be directed to the point that the committee have decided that the diameters of flanges, diameters of bolt circles and numbers of bolts should be identical for the three last-mentioned standards, the only differences being in the thickness of the flanges and the diameters of the bolts.

With regard to the welded-on flanges of wrought-iron and steel, it was difficult to avoid the establishment of a third series of dimensions, for the reason that the strength of joints made with such flanges is materially increased by reducing the diameter. This series gives the dimensions for welded-one flanges for use in long pipe lines, except, of course, at points where valves are to be fitted. The flange and bolt-circle diameters are identical with those in the first series, but the thicknesses of metal, and the numbers and diameters of the bolts, are proportioned to suit steam pressures ranging from 125 pounds to 325 pounds per square inch. Two other tables contain standards for short bends and tees of cast metal, and for long bends of wrought-iron and steel.

A Boiler With a Record

It is interesting to note that many as have been the changes in the evolution of the house heating boiler now on the market, the Florida steam boiler, made by the Pierce, Butler & Pierce Mfg. Co., of Syracuse, N. Y., has remained practically unchanged since its first introduction 20 years ago, and yet has lost none of its old-time popularity. Such slight modifications which have been made in design and construction of the Florida have only been such as time and practice have demonstrated to be of positive merit.

Trade Literature

"COMPRESSED FACTS ABOUT COMPRESSED AIR," is the title of a handsome little blue and gold booklet of 32 pages, published by the Clayton Air Compressor Works, of 114 Liberty street, New York city. It is designed to give a resumé of the points to be considered in buying an air compressor of medium capacity. Illustrations showing some type of compressor or part thereof adorn every page and the separation of the text into brief chapters renders the booklet especially readable.

THE MODEL HEATING COMPANY gets out a neat little pamphlet telling the why and wherefore of the "Model" design of boiler. Besides showing how this boiler fills the requirements, there are a number of half-tones explaining each particular fine point step by step. The same company's series of vest-pocket folders continues to make its periodical visits, containing always information of interest.

THE KELLOGG-MACKAY-CAMERON COMPANY have issued their new 1905 boiler price list. It is of pocket size, 65 pages, and gives lists of data, capacities and prices of their different boilers and water heaters. It also contains lists of radiators manufactured by them and shows the "Kewanee" pattern in one, two, three and four columns. Lists are given, also, on other supplies, enabling the fitter to quote from it on the entire heating plant.

AN EXCEPTIONALLY complete and well-printed catalogue on bolt threading, pipe threading and nut tapping machinery is that just issued by the Reliance Machine and Tool Co., of Cleveland, Ohio. Besides giving 30 half-tone illustrations of its machinery, the booklet also contains tables showing various standards of screw threads, decimal equivalents of parts of an inch, millimeters in inches, table of surface speeds and standard dimensions of wrought-iron welded pipe.

A NEW BOOKLET, issued by the United States Heater Company, Detroit, Mich., is entitled "Modern Warming Methods." As its title implies, the booklet gives some interesting information in regard to the more up-to-date systems of heating by low pressure. The booklet will not be generally distributed but may be had on application to the company.

A RECENT PUBLICATION, issued by Warren, Webster & Co., Camden, N. J., is a handsomely gotten-up booklet illustrating and describing the Webster Feed-Water Heater and Chemical Purifier. Besides describing the heater and its operation the booklet goes on to treat of the subject of scale in boilers, and the necessity for the purification of the water used.

PRUDENTIAL HEATERS are illustrated in a nice little book sent us by the Prudential Heating Co., Akron, O. Their boiler is of the cast iron vertical, sectional type, the intermediate sections having a single water leg, the heating surface projecting forward and overhanging the fire and the sizes increased by adding sections at the side.

These boilers are made with 20-inch and 30-inch grate, referring, of course, to the measurement from back to front, and the capacities range from 500 to 1,500 feet of steam and from 1,825 to 2,600 feet of water.

Copies of the book will be sent on application.

TRADE AND MISCELLANEOUS NOTES

PIERCE, BUTLER & PIERCE MFG. CO., Syracuse, N. Y., announces that N. W. Taylor will cover the territory heretofore taken by E. H. Giles. Mr. Taylor has had experience in steam and hot water engineering in this country and in Canada, both in the laying out of heating work and, to some extent, in the manufacture of goods.

POWERS REGULATOR COMPANY, Chicago, Ill., has completed the installation of an elaborate system of heating and ventilation in the New York Hippodrome. This installation is unique in many respects, very complete arrangements having been made to secure adequate ventilation and proper regulation of temperature.

ALBANY STEAM TRAP CO., Albany, N. Y., reports a remarkable experience had with one of its traps in a roundhouse of the New York Central Railroad, at Poughkeepsie, N. Y. The tray was purchased twenty-seven years ago, in 1878. It has been "on the job" continuously until within two or three years, when some of the parts became worn. The cost of the repairs was $16.50. The foreman of the roundhouse, which is kept running day and night, says in a letter to the company, after referring to the purchase on February 2, of the new fitting for the trap: "Trap was started, and in checking up the coal used in January, 1905, as against the amount used for 25 days in February, I find that we have saved over 66 tons of coal in 25 days, and over 125,000 gallons of water." This record of the efficiency of the steam trap in question is one of which its manufacturers may well be proud.

UNITED STATES HEATER COMPANY, Detroit, Mich., announces the appointment of E. A. Stark as manager of the company's Chicago branch. Mr. Stark has been for a number of years identified with the Knight & Tillson Co., of Indianapolis. The company is about to enlarge and remodel its Chicago offices at their present location, 42 Dearborn street, to meet its increasing business and to display several new additions to its lines of boilers and radiators.

NEW OFFICERS were elected by the National Metal Trades' Association, at its annual meeting in Chicago, March 23 last, as follows: President, J. W. Gardner, Quincy, Ill.; vice-presidents, F. A. Geier, Cincinnati, and W. D. Sayle, Cleveland, Ohio; treasurer, F. K. Copeland, Chicago, Ill. Administrative Council (to serve two years)—O. P. Kinnard, Minneapolis; C.

FUEL ECONOMY GUARANTEED
VACUUM STEAM HEATING SYSTEM
Morgan & Co. Chicago.

HEALTH—COMFORT—ECONOMY
DEMAND AUTOMATIC CONTROL OF TEMPERATURE.
WE SUPPLY THE DEMAND
SEND FOR CATALOGUES
THE POWERS REGULATOR CO.
111 FIFTH AVENUE NEW YORK
40 DEARBORN ST. CHICAGO

E. Hildreth, Worcester; George K. Gavin, New York, and C. Bermingham, Kingston, Ont.

MR. J. D. SUTCLIFFE, managing director of the Sutcliffe Ventilating and Drying Co., Ltd., of Manchester, England, was a recent caller at the office of THE HEATING AND VENTILATING MAGAZINE. Mr. Sutcliffe is on both business and pleasure bent, and expects to remain in this country until the middle of May. He informed us that his company has been awarded the largest heating and ventilating contract on record in the United Kingdom. The building is a new factory for the Sunlight Soap Works, and it covers five acres of ground. The Plenum system of ventilation will be used, and five large blowers will supply sufficient air to give each operative 3,000 cubic feet per hour.

BUILDING TRADES EMPLOYERS' ASSOCIATION, New York, is contemplating the building of a $1,000,000 home for the organization. At its annual meeting, April 11 last, a committee was appointed to look into the matter. The newly-elected officers are: President, William H. McCord, of the Iron League; first vice-president, Lewis Harding, of the Master Carpenters' Association; second vice-president, Charles A. Cowen, of the Mason Builders' Association, and treasurer, Paul Starrett, of the George A. Fuller Company; Chairman of the Board of Governors, James R. Strong, of the Electrical Contractors' Association. Mr. P. K. Stephenson was re-elected secretary of the association.

U. S. HEATER CO., Detroit, advises us that they have secured the services of W. J. Tucker to represent them in the Southern States, with headquarters at Atlanta, Ga. Mr. Tucker is well known to the trade, having for years had charge of the Atlanta office of the Philip Cary Mfg. Co. Mr. Tucker's acquaintance with the trade and his other qualifications should insure his success.

Business Changes

MODEL HEATING CO., 91 Centre street, New York, have moved to 76-78 Centre street.

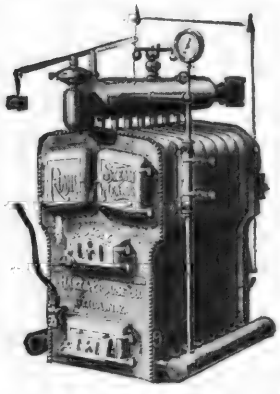
SEWARD ENGINEERING CO., 89 Centre street, New York, have moved to 141 Worth street.

GRIFFIN-TRAVIS CO., Queens Borough, New York, has been incorporated by O. J. Griffin, I. V. Travis, Jr., and Anna B. Griffin with a capital of $2,400, to deal in heating apparatus.

LEIGHTON PLUMBING AND HEATING COMPANY, Bangor, Me., has succeeded Leighton, Davenport & Co.

EDWIN HAWES COMPANY, Worcester, Mass., is the title of a firm recently incorporated with a capital of $20,000,

ROYAL HEATERS



LARGEST AND MOST SUCCESSFUL LINE OF HEATING APPARATUS IN AMERICA

Hot Water and Steam Heaters, Combination Heaters, Hot Air Furnaces

HART & CROUSE COMPANY

78 La Fayette Street, UTICA, N. Y.

COLUMBUS, OHIO CHICAGO, ILL., 79 Lake St. NEW YORK, 235 Water St.

BRITISH STEAM SPECIALTIES, Ltd., Fleet Street, Leicester, England.
MAGUIRE & GATCHELL, Ltd., Dublin, Ireland.

to deal in steam and hot water heating goods. The incorporators are: Edwin Hawes, James E. L. Todd and Daniel P. Callahan.

TAYLOR BROTHERS COMPANY, Rochester, N. Y., is building a new factory which will contain 60,000 square feet of floor space.

H. W. JOHNS-MANVILLE CO. has acquired a controlling interest in the Holland Supply Company, San Francisco, Cal.

HULL-CAMP COMPANY, New York, is preparing to construct a new foundry at Lehighton, Pa., for the manufacture of Carbon boilers.

CROSBY STEAM GAGE & VALVE CO., has changed its New York office from 78 John street to 16 Dey street.

FRED. D. JOHNSON CO., New York, is about to move into new and larger quarters at 28 East Twentieth street, a door or two away from the present office.

J. H. WILLIAMS & COMPANY'S new factory, at Hamilton avenue and Richards street, Brooklyn, was the scene, on April 1 last, of a celebration by the employees of the company. Those present numbered nearly 700. During the evening's entertainment the employees formally presented to the company a national flag measuring 12x25 feet. The flag was accepted on behalf of the company by the president, William C. Redfield, in a happy little speech of appreciation.

GARLOCK PACKING COMPANY, Palmyra, N. Y., has been incorporated with a capital of $100,000, for the manufacture of packing for steam and air. Following are the directors: O. J. Garlock, F. W. Griffith and J. H. L. Gallagher, all of Palmyra.

INTERNATIONAL HEATER COMPANY, at its annual meeting, March 21, in Utica, N. Y., elected the following as its directors: C. F. Simmons, H. R. Williams, J. F. Maynard, W. T. Baker, E. J. Millspaugh, F. H. Moore and F. E. Wheeler. The Board elected the following officers: President, F. E. Wheeler; vice-president, H. R. Williams; secretary, W. E. Hopkins; treasurer, F. H. Moore.

ABENDROTH BROTHERS, Port Chester, N. Y., are about to double the present capacity of their boiler capacity by adding a new moulding shop, and a new warehouse and machine shop, six stories high, to their plant.

AMERICAN RADIATOR COMPANY has moved its Philadelphia office from 622 Arch street into new and larger quarters at 1342 Arch street, where it will occupy the entire building.

"Sunrays" are pleasant in Winter

Why not use Sunrays in your business?

We will make it pleasant and profitable for you to use them.

The J. L. Mott Iron Works

84-90 Beekman St., New York

AMERICAN RADIATOR CO. have made very few changes in their factory and selling organizations for this year, but there is one important one. Frank B. Howell, who has been the manager of the Bond Plant, Buffalo, now occupies an important position in connection with the sales department. His field will be the East, embracing the company's branch offices at New York, Boston, Philadelphia, Washington and Buffalo.

Mr. Howell's first connection with the company was as a salesman in connection with the New York city office, but for years the company have availed themselves of his expert technical and mechanical knowledge, first at their works in Detroit and latter, as above stated, at Buffalo, where he supervised the construction of the big Bond Plant.

Frank Whitelaw, who has been assistant manager of the Michigan plant at Detroit, goes to Buffalo to fill the vacancy left by Mr. Howell; Mr. Whitelaw's place is taken by Henry Rente.

New Firms

SHURTLEFF VACUUM HEATING CO., Moline, Ill., was recently licensed to incorporate at a capital of $25,000. The company will manufacture appliances invented and patented by Wilfred Shurtleff, of Moline.

BLAKE HARDWARE COMPANY, Billingham, Wash., has been incorporated with a capital stock of $9,500 to carry on a wholesale and retail heating, plumbing and hardware business.

E. ROBINSON COMPANY, Pittsburg, Pa., composed of E. Robinson, Ferdinand J. Hanley and Henry F. Schupp, to conduct a steam and hot water heating, gasfitting and plumbing business.

FRED. T. BUXTON and William Allard, Nashua, N. H., have established a steam fitting and plumbing office in the Sharns Block, Railroad square.

M. L. PARKER COMPANY, Freeport, Ill., has been incorporated to manufacture heating and plumbing supplies. The incorporators are M. L. Parker, J. F. Manion and L. L. Couter.

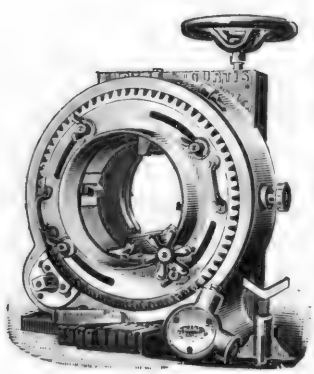
LEIGHTON PLUMBING & HEATING CO., Bangor, Me., has been incorporated with a capital of $10,000. The officers are W. H. Rollins, president, and George S. Chalmers, treasurer.

McELHINNEY & TABOR CO., Burlington, Ia., is a new corporation organized to do a general heating, plumbing and lighting business. Albert S. McElhinney is president of the new firm and Frank C. Tabor, secretary and treasurer.

THIEF RIVER FALLS HEATING & PLUMBING CO., Thief River Falls, Minn., has been incorporated to conduct a heating and plumbing business.

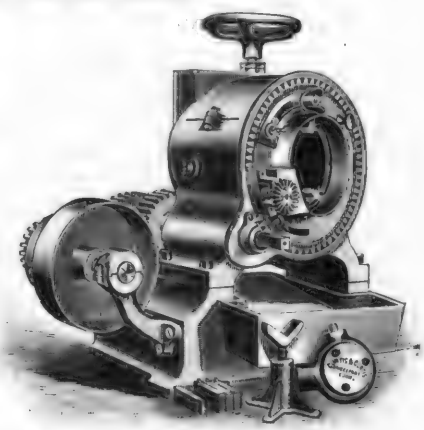
FORBES' PATENT DIE STOCKS

Pipe Cutting and Threading Machinery For Hand or Power



Pipe up to 15 inch cut off and threaded by one man with ease

PORTABLE and SIMPLE



SEND FOR ILLUSTRATED CATALOGUE

THE CURTIS & CURTIS CO.

48 Garden Street BRIDGEPORT, CONN.

JAMES REYNOLDS COMPANY, Rochester, N. Y., has been incorporated with a capital of $18,000, to make steam and hot water specialties and apparatus.

JOHNSON FURNACE & ENGINEERING CO., Portland, Me., incorporated by F. D. Marshall, E. D. Sparrow and G. M. Seiders, with a capital of $1,000,000 to deal in heaters.

M. L. PARKER CO., Freeport, Ill., incorporated by M. L. Parker, L. L. Conter and J. F. Marion, with a capital of $5,000 for the manufacture of heating and plumbing supplies.

PREST HEATING CO., Kansas City, Mo., incorporated by B. W. Harwood, W. O. Thomas and T. S. Prest, with a capital of $36,000.

FIEBERGER HEATING CO., Akron, O., incorporated by Frank Fieberger, Frank Nolte and H. J. Hough, with a capital of $50,000 for the manufacture of heating apparatus.

TACOMA PLUMBING & HEATING CO., Tacoma, Wash., incorporated by M. A. Thompson and Henry Buechle, with a capital of $5,000.

UHLRICH & WIELAND HEATING & PLUMBING CO., Erie, Pa., is a new concern incorporated by G. W. Uhlrich and C. B. Wieland to do all kinds of plumbing, gas, steam and hot water fitting.

Contracts Awarded

McGINNESS, SMITH & CO., Pittsburg, Pa., inform us that in our report of their contract for the heating of the Toxaway Inn, we should have located same at Toxaway Lake, N. C., which is a different place from Toxaway.

ALEX. DUNCAN & CO., Boston, Mass., have the hot water heating contract for O. Atherton Shepard's new $25,000 residence on Gardner Road.

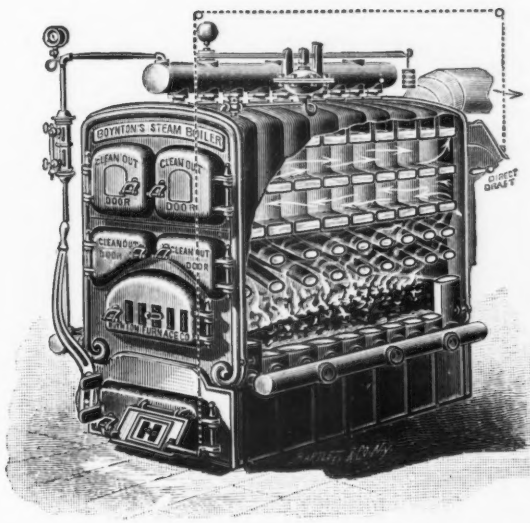
CLEGHORN COMPANY, Boston, Mass., has been awarded the steam heating contract for the new office building at Massachusetts avenue and Newbury street.

PHILLIPS HEATING AND VENTILATING COMPANY, Los Angeles, Cal., is heating and ventilating the new Franklin school building at Pasadena.

HAVEN HARDWARE CO., Santa Rosa, Cal., will do the heating and plumbing work on the new Occidental Hotel at that place.

POWERS REGULATOR CO., Chicago, Ill., have recently secured contracts for automatic temperature control in the following buildings: Majestic Theater, Chicago; Central and Dairy Buildings, Ames, Iowa; Eleventh Ward School, Allegheny, Pa.; school at Wilbur, Wash.; school at Barrington, Ill.; jail and sheriff's residence, Pittsburg, Pa.; Northwestern National Life Building, Minneapolis, Minn.; Girard School, Philadelphia, Pa.;

The Boynton Steam Boilers and Hot Water Heaters



Manufactured in 84 Sizes suitable for any requirements.

Adapted for Hard or Soft Coal, Wood or Natural Gas.

WRITE FOR CATALOGUE

The BOYNTON FURNACE COMPANY

207 and 209 Water Street NEW YORK — 10 Post Office Square BOSTON — 147 and 149 Lake Street CHICAGO

school at Schenectady, N. Y.; high school at Glen's Falls, N. Y.

P. F. DICKINSON, New York, is at work upon a complicated direct and indirect steam heating plant in the Brook Club House on East Fortieth street.

LEVI, CASE & CO., Schenectady, N. Y., have secured the contract for the heating, ventilating, etc., of the Eastern avenue school of that city. Their figure was $10,475.

DENNY BROTHERS, Newark, N. J., have the contract for the steam heating of the Newark Eye and Ear Infirmary. The radiation includes both direct and indirect.

MANSFIELD PLUMBING COMPANY, Passaic, N. J., is doing the steam heating in the new Volger factory, and in the new National Hotel.

LEWIS & KITCHEN, Kansas City, Mo., have been awarded the contract for heating the Humboldt school in that city. The contract price was $9,375. The contract for the heat regulation of the same building was obtained by the Johnson Service Company at their bid of $1,750.

F. E. McCORMACK & CO., Lestershire, N. Y., have secured the contract for the heating and plumbing of the new Bundy factory at Endicott.

INGALLS & KENDRICKEN, Boston, Mass., have placed six 150 horse power boilers in the new Siegel Building, Washington street, Boston.

WILLIAM A. DAVIS, New Bedford, Mass., is heating a new building at Fairhaven, erected by the Fathers of the Sacred Heart.

SUTHERLAND COMPANY, Walla Walla, Wash., has been given the contract to instal the heating and plumbing in the new Schmitt Building at Pendleton, Ore.

G. S. BLODGETT COMPANY, Burlington, Vt., is installing the heating and gas piping in Mount St. Mary's Academy.

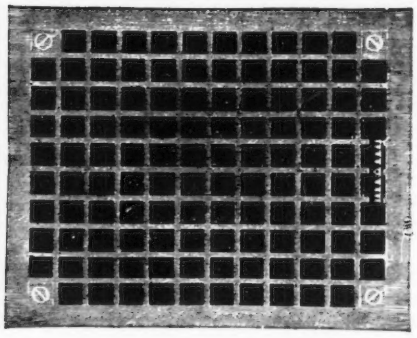
HESS & RAU, Watertown, S. D., have been awarded the contract to install a steam heating plant in the Goss Block, of that place.

WEST END HEATING & ENGINEERING CO., Philadelphia, Pa., has secured the contract for installing a heating plant in the Atlantic City post office. The contract price is $5,109.

FRED. ARMSTRONG, Toronto, Can., has the contract for the heating and plumbing of the new Queen Alexandra School in Toronto. His bid for the heating was $8,500.

GEORGE S. STOKES, Mahanoy City, Pa., has been given the contract for installing a steam heating system in St. Stanislau's Roman Catholic Church at Shenandoah.

KERNAN WELCOME REGISTERS



PLAIN LATTICE DESIGN

Suitable for large work where architects wish a plain construction. We are prepared to make and furnish promptly any special sizes in this design and to electro-plate to match any finish of hardware or decoration.

Syracuse Stove Works, Syracuse, N. Y.

TELEPHONE **NEW YORK OFFICE AND WAREHOUSE 231 WATER STREET** 383 JOHN

JOHN B. BEEGAN, New Haven, Conn., has secured the contract for heating the new St. Joseph's Church on Edward street, New Haven.

EDWARD S. MOBLEY & BRO., Frederick, Md., heating Cottage E at Springfield Hospital for the Insane of the State of Maryland, at Sykesville.

J. W. DRAPER, Northampton, Mass., heating and plumbing remodeled Mansion House Hotel block.

EDWIN HAWES CO., Worcester, Mass., heating new convenience station.

ST. JOHN & BARNES, Colorado Springs, Col., heating and plumbing fifteen new buildings at Fort Russell, Wyo.

SCHNEIDER PLUMBING CO., Cleveland, O., heating and plumbing residence of H. Caulby, Clifton Park, O.

BREEN BROS., Utica, N. Y., heating Mohawk State Armory, Richfield Springs, N. Y.

DAVID R. BURNS, Philadelphia, Pa., heating residence at 222 South Thirty-ninth street.

ALEX. M. BARCLAY, 113 North Sixth street, Philadelphia, Pa., heating and plumbing four-story factory.

J. J. BARGER, 2518 Columbia avenue, Philadelphia, Pa., heating large building at Twentieth street and Montgomery avenue.

CLEVELAND STEAM FITTING & SUPPLY CO., 1084 Hamilton street, Cleveland, O., heating Arch Hall on Ontario street.

VAN SICKLE & WARREN CO., 12 Frankfort street, Cleveland, O., heating new residence of J. G. W. Cowles on Euclid Heights.

M. G. HOLBROOK, 416 Arcard Building, Cleveland, O., heating new hotel on Superior street.

The Albany Return Steam Traps

have been the **STANDARD** for over **THIRTY-TWO YEARS.** For returning water under pressure to the boiler, they will perform this duty fully as well, and in many cases better than the so-called steam loop.

Send for circulars A, B, C and D.

MANUFACTURED BY

ALBANY STEAM TRAP CO., ALBANY, N.Y.

FREDERICK TOWNSEND, PRESIDENT — JAMES H. BLESSING, GEN. MGR.

TO THE TRADE

The New Directory for 1905 of Master Plumbers and Master Steam and Hot Water Fitters of United States and Canada, also list of Manufacturers and Jobbers, with classified list of goods manufactured in Plumbing, Lighting and Steam Heating, including the trade names of Closets, Bath Tubs, Hot Air, Steam and Hot Water Heaters and Boilers, is now being compiled. This Directory is the need of the day and a Buyers' Reference. Subscribers can have their name in display type without extra expense. Send in your order for a copy. Price $5.00 when published. Advertising rates given on application.

Plumbing and Heating Publishing Co.

Room 6074, Metropolitan Building — **NEW YORK CITY**

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